

Using Growth Mindset to Improve Teaching and Learning

Marty Samuels (msamuels@brandeis.edu)

he/him/his

Program Director, CTL

Learning Goals and Objectives

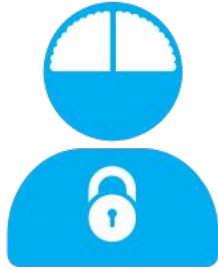
Learning Goal. To understand the value of having a growth mindset both for yourself and for your students.

Learning Objectives.

By the end of this workshop, you will be able to:

- Define “**growth mindset**” and “**fixed mindset**.”
- Explain how students with a fixed vs growth mindsets **view effort, attribute failure, and strategies**, and how these can contribute to differences in their behavior.
- Describe why having a growth mindset **matters**.
- Develop **strategies** you can use in the classroom to help your students to develop a growth mindset.

Mindsets about Intelligence



fixed

Human traits are fixed

Fixed mindset about intelligence:

You have a certain amount of intellectual ability and can't do anything to change it



growth

Human traits are malleable, they can be shaped and developed

Growth mindset about intelligence:

Intelligence can be developed through personal effort, good learning strategies, and lots of mentoring, support, and feedback from others.

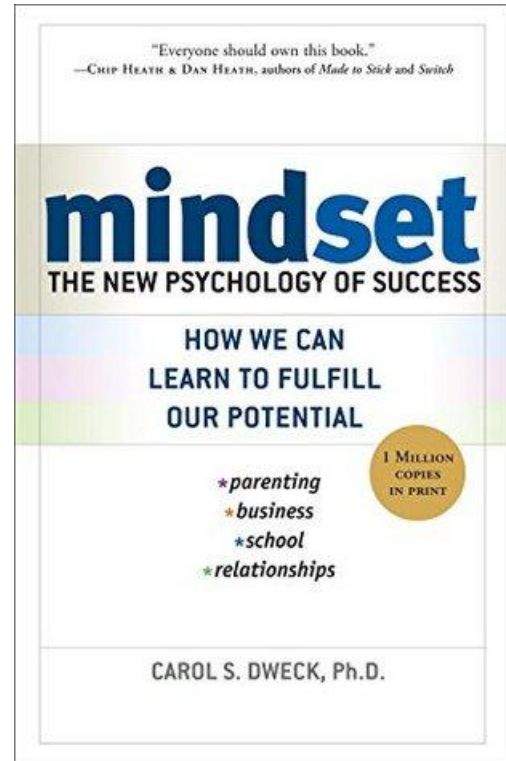
What is mindset?



Image: Stanford

Carol Dweck, Ph.D.

Professor of Psychology (Stanford)



(2006)

For each of the six categories below, both a growth mindset and a fixed mindset characteristic are provided. Decide which characteristic is **growth mindset oriented** for each of the six categories and **box it**

| | | |
|-------------------------------|---|---|
| Views on effort | Effort is seen as an important component of learning | Effort is seen as sign of weakness |
| Goal orientation | Performance goal orientation (picks challenges they know they can meet, uses them to prove yourself to others) | Mastery goal orientation (picks increasingly more difficult challenges) |
| Attribution of failure | Attributes failure to lacking ability or blames others or the circumstances | Attributes failure to not having put in enough effort or preparation, or having used ineffective strategies |
| Strategies | Increases effort, tries new things, asks for help from others | “Learned helplessness” or tries to persevere with the same (ineffective) study strategy |
| Feedback | Avoids feedback, acts defensively | Seeks out feedback |
| Results | Persistence, overcomes initial challenges, finds ways around it | Loses interest and withdraws in response to challenges, self-sabotage |

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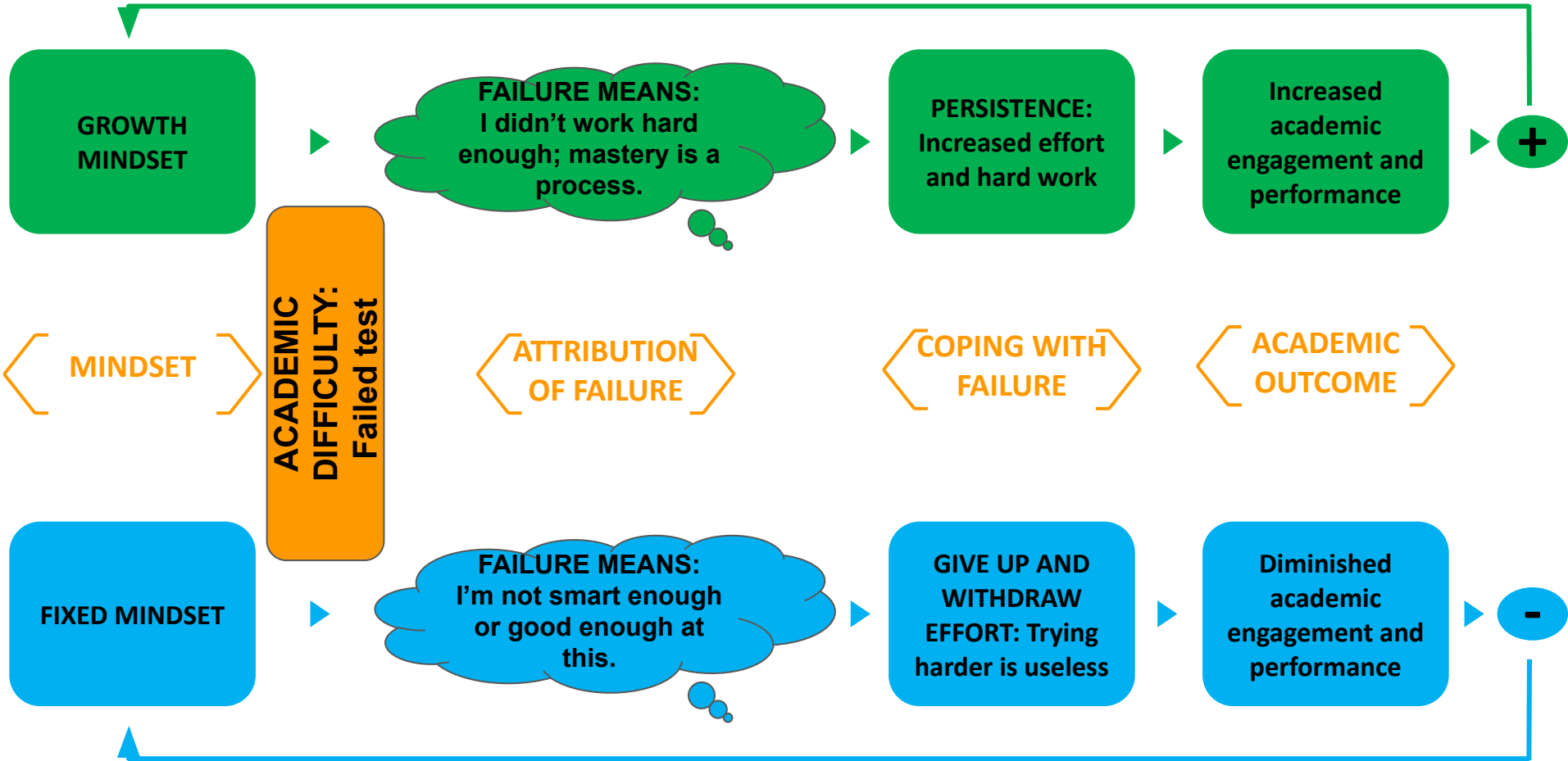
“Do people with [growth] mindset believe that anyone can be anything, that anyone with proper motivation or education can become Einstein or Beethoven?”

*No, but they believe that a person’s **true potential is unknown** (and unknowable); that it’s impossible to foresee what can be accomplished with years of passion, toil, and training.”*

-Carol Dweck

Why does having a **growth mindset** matter?

Why mindsets matter



- University-wide survey (Indiana?)
- 150 STEM faculty surveyed (out of 468 responded)
 - 7 semesters
 - 634 courses
 - 15,466 students

How do you think the **Growth** mindset teachers speak or behave differently in their class than their **Fixed** colleagues?

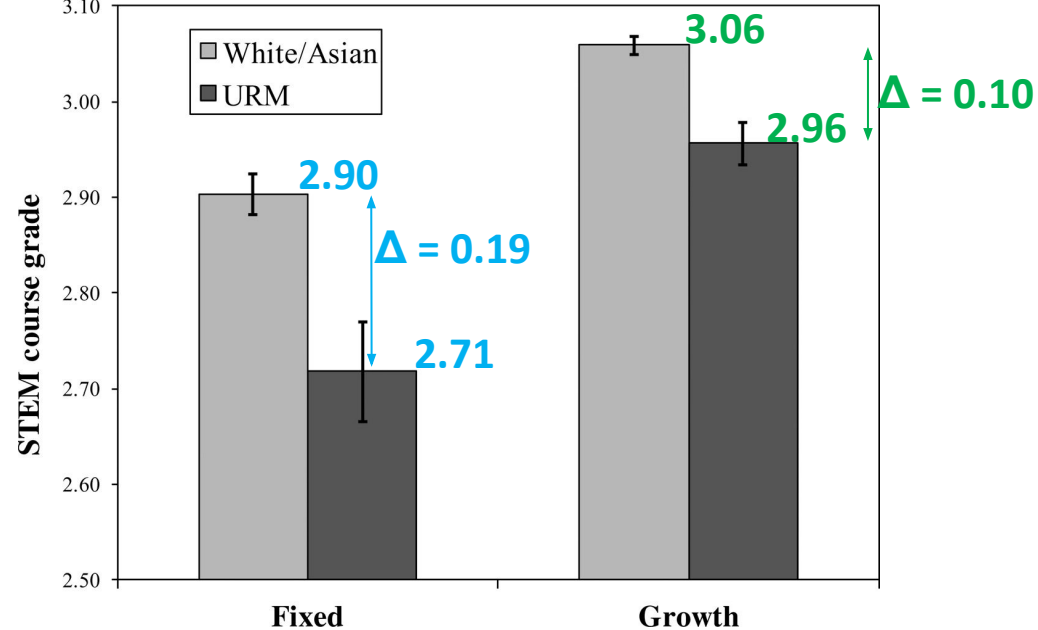


Fig. 1 Faculty mindset beliefs predict the racial achievement gap in STEM courses. Predicted values are computed from the interaction between faculty mindset beliefs (fixed = -1 SD, growth = +1 SD) and students' URM (Black, Hispanic, Native American) status. Error bars represent ± 1 SE.

- Faculty asked (**1- strongly agree**; **6- strongly disagree**):
 - “To be honest, students have a certain amount of intelligence, and they really can’t do much to change it.”
 - “Your intelligence is something about you that you can’t change very much.”

Which of these quotes do you think was said by a **Growth** mindset prof? Which of these were said by a **Fixed** mindset prof?

“Sometimes you have to not push them through it but lead them through the forest a couple of steps ahead the first time. (...) You’re guiding them. (...) And then the hope is that they do this and learn from that. But then they have to be able to try to go through the forest on their own (...).”

“[I]t’s about learning how to solve their own problems or the problems they encounter, so teaching for me is enablement. (...) Enabling an individual to encounter new problems and self-solve them. That’s teaching to me.”

“I provide them with all of the basic information that they need to learn the material, and there are many complaints because they say the exams are at a much higher level, but that’s their job.”

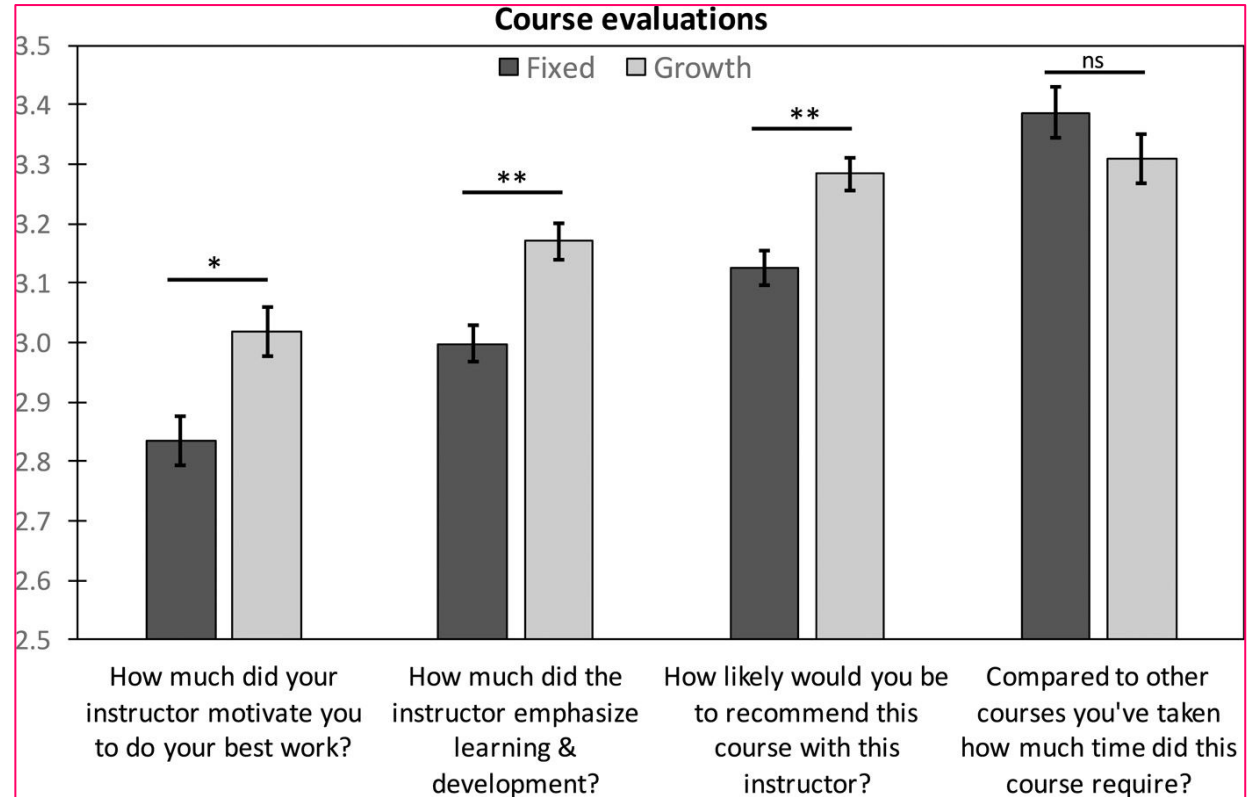
“Fundamentally, [teaching is] changing someone’s understanding of the world by making it deeper and in-line with the scholarship of what is rigorously true according to our scientific methods.”

“But it’s not that important for you to understand how those facts were arrived at or those systems were developed. You just need to learn them. And in that case I think it’s important for people to be presented with those systems.”

“[Y]ou can’t really teach people. You can facilitate that, but they have to do it. And so I see my place as more of a facilitator now. (...) I would want them (...) to still remember the core principles that were taught in the course...”

Why do faculty with fixed mindsets have worse learning outcomes?

Student evals:



Question:

In general, do people in [your discipline] believe that the raw, innate talent is the most important factor for success in your discipline, and motivation and sustained effort are secondary.

Answer to yourself on a 7-pt scale:

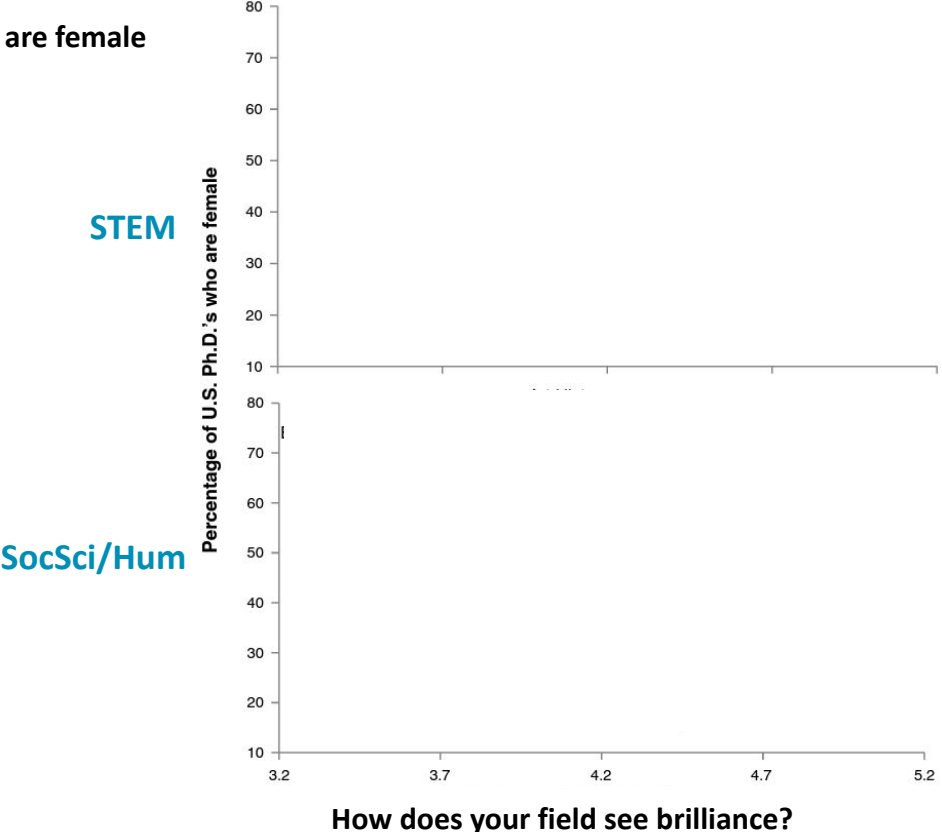
1= strongly disagree that innate, unteachable talent is the most important factor

7= strongly agree that innate, unteachable talent is the most important factor

Expectations of brilliance underlie gender distributions across academic disciplines

% of U.S. Ph.D.'s who are female (2011)

n= 1820 survey respondents (faculty, post-docs, grad students)

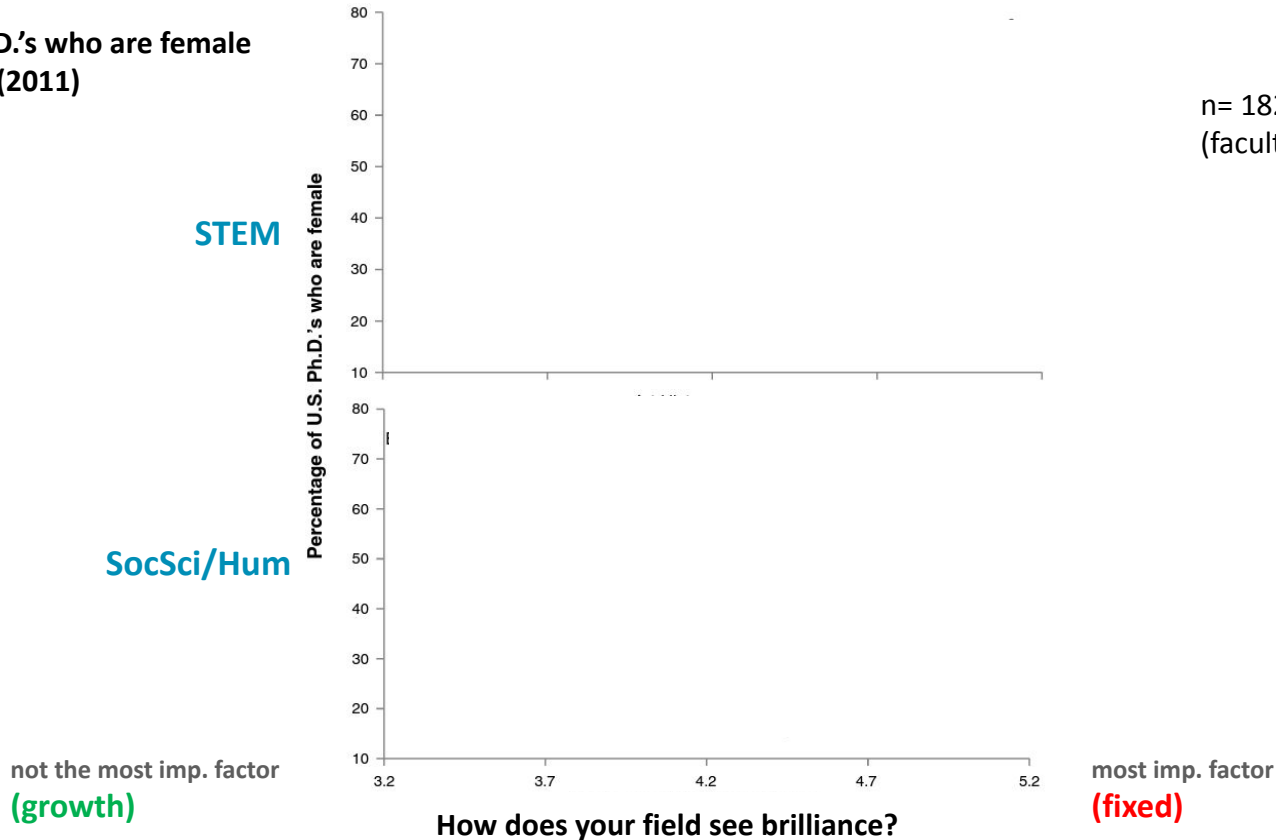


[Leslie, S.J., et al. \(2015\). Expectations of Brilliance Underlie Gender Distributions Across Academic Disciplines. Science.](#)

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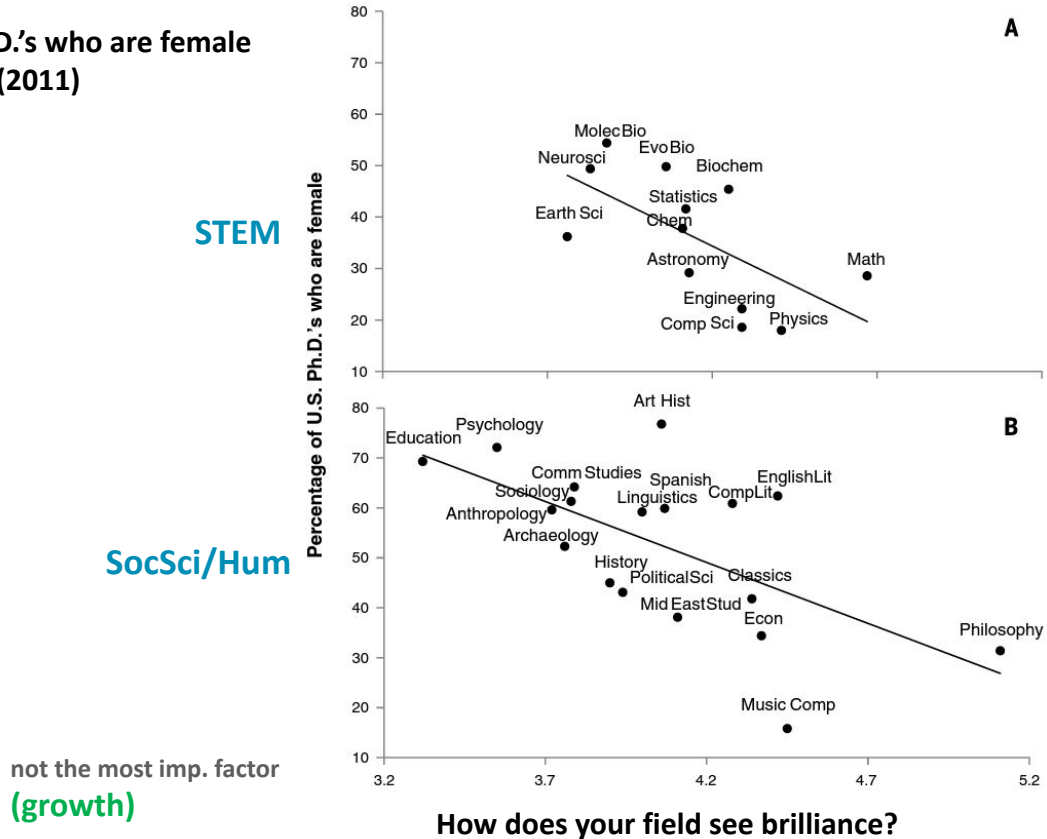


not the most imp. factor
(growth)

most imp. factor
(fixed)

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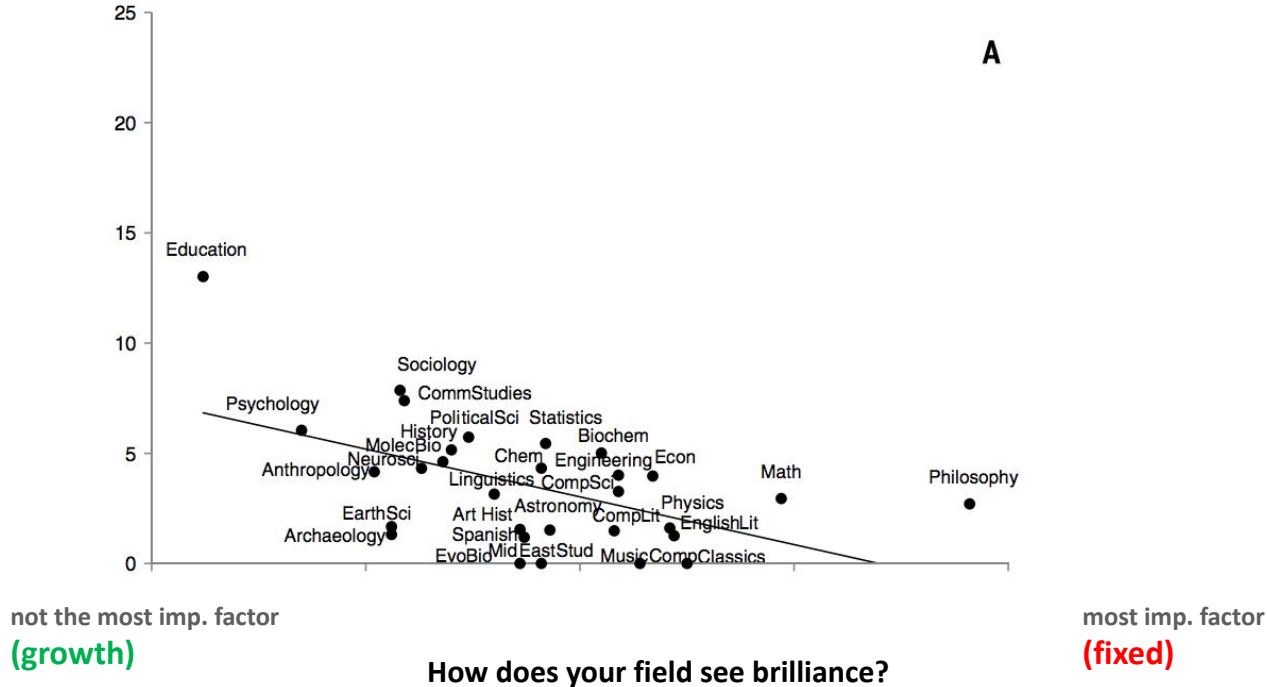
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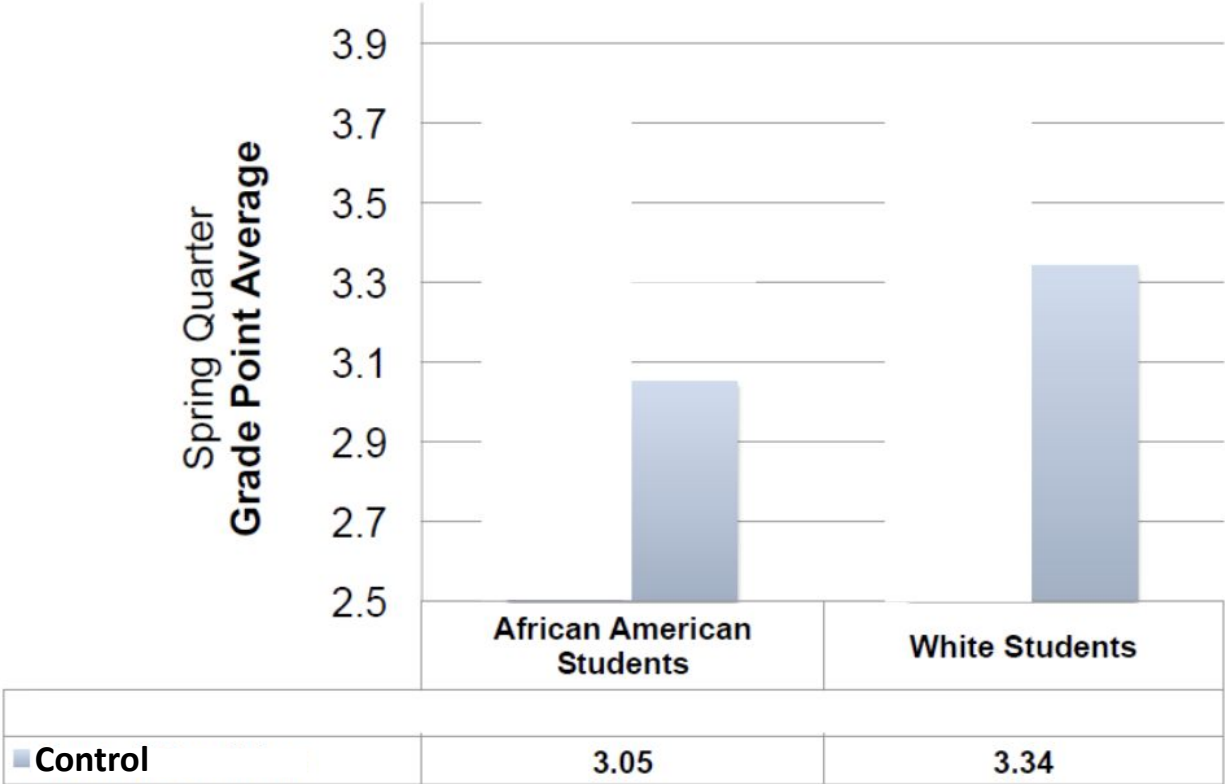
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Expectations of brilliance underlie gender distributions across academic disciplines

% of U.S. Ph.D.'s who are African American (2011)



Growth Mindset Intervention

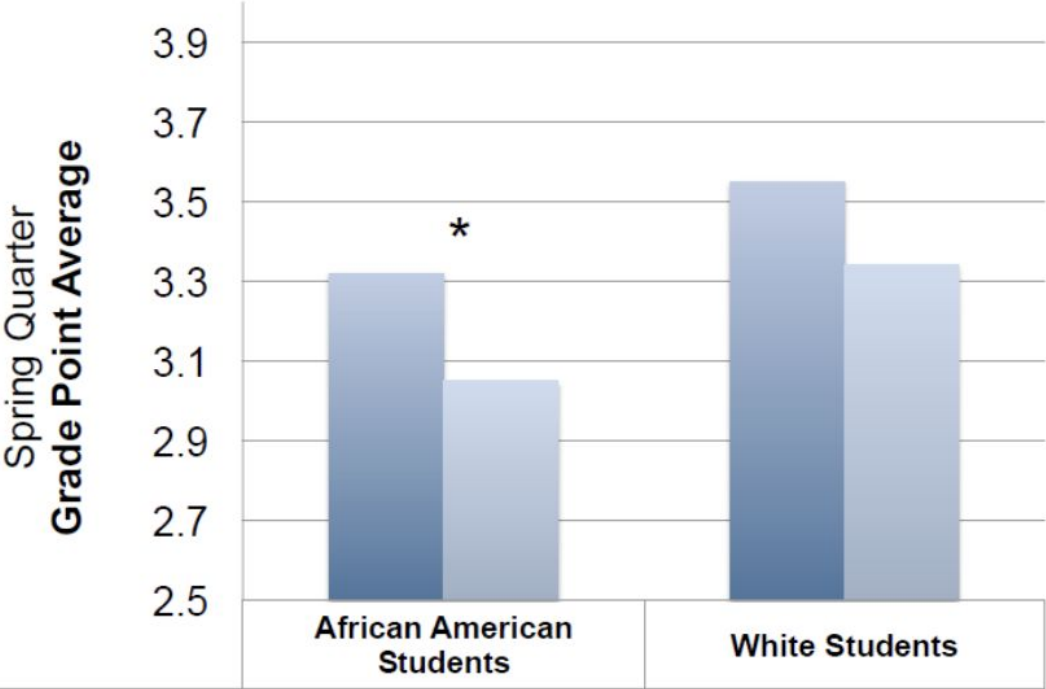


[Aronson, Joshua, Carrie B. Fried, and Catherine Good. "Reducing the Effects of Stereotype Threat on African American College Students by Shaping Theories of Intelligence." Journal of experimental social psychology 38.2 \(2002\): 113–125.](#)

Growth Mindset Intervention

Growth mindset intervention:

- College students were pen pal mentors to a struggling middle school student
- **GM** college students were asked to help the middle school student see intelligence as a capacity that can grow “like a muscle”.



| | | |
|-------------------------------|------|------|
| ■ Growth mindset intervention | 3.32 | 3.55 |
| ■ Control | 3.05 | 3.34 |

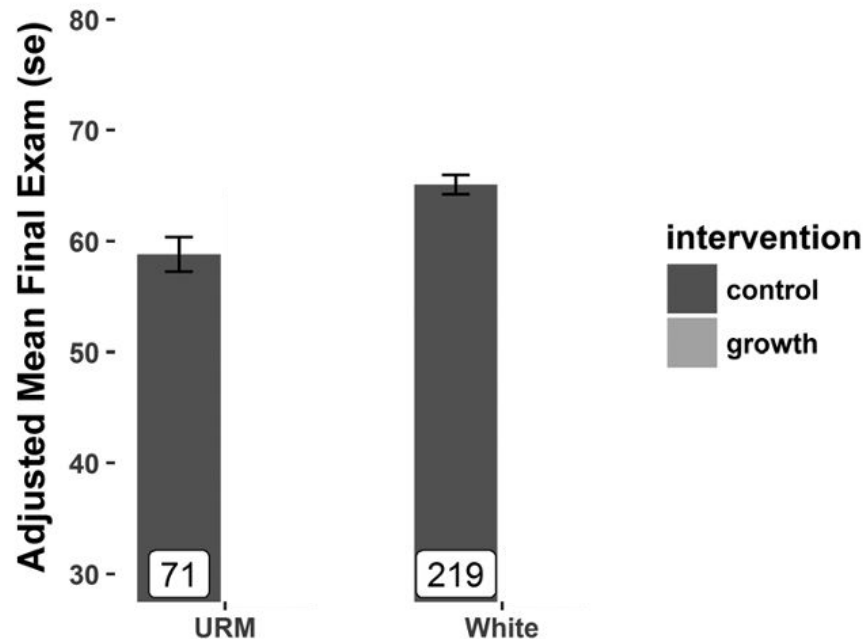
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Growth vs Fixed Mindsets in Chemistry Class

Wash U., St. Louis.

Three-part online intervention:

1. Students read a short article on **growth mindset** as part of a hw assignment early in the semester.
2. Students were asked to reflect about how having a **growth mindset** will help them prepare for their **second midterm**.
3. Students were asked to reflect about how having a **growth mindset** will help them prepare for their **final exam**.

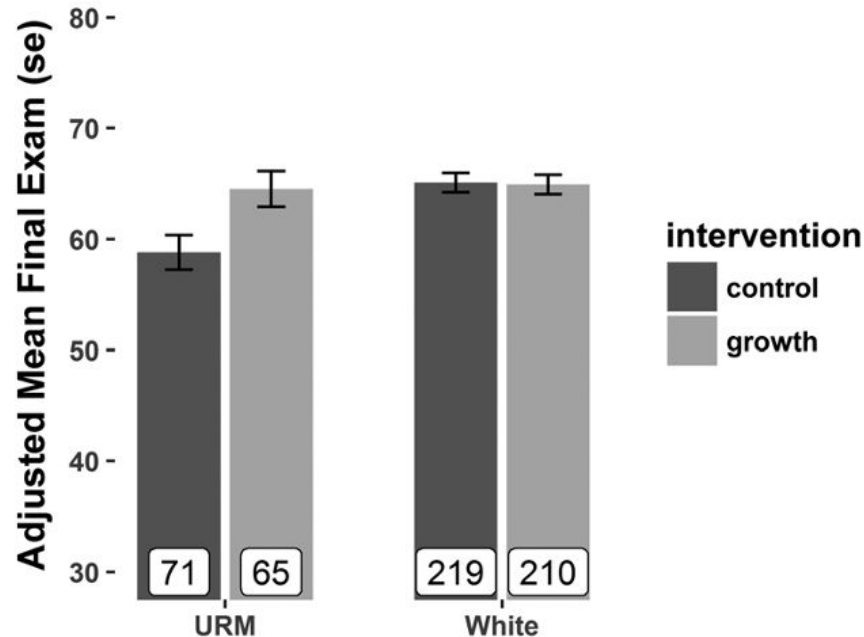


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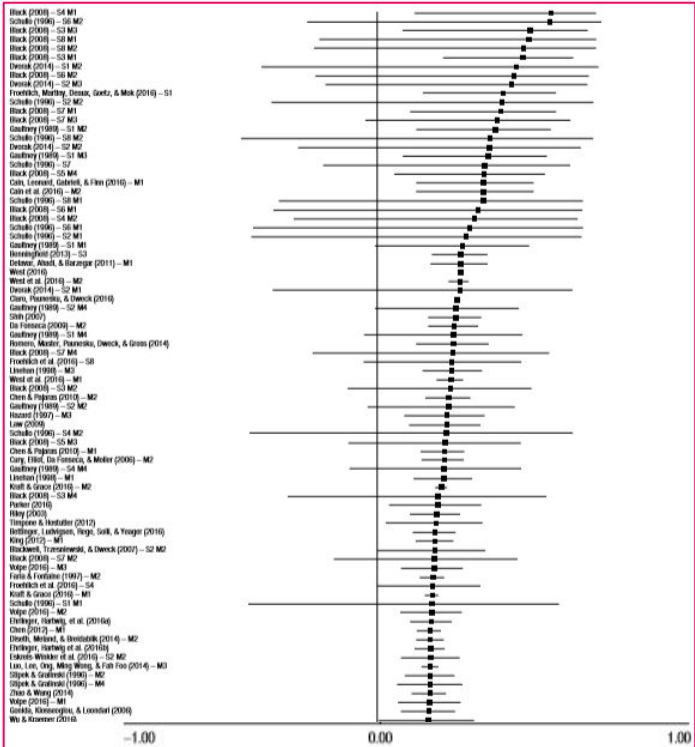
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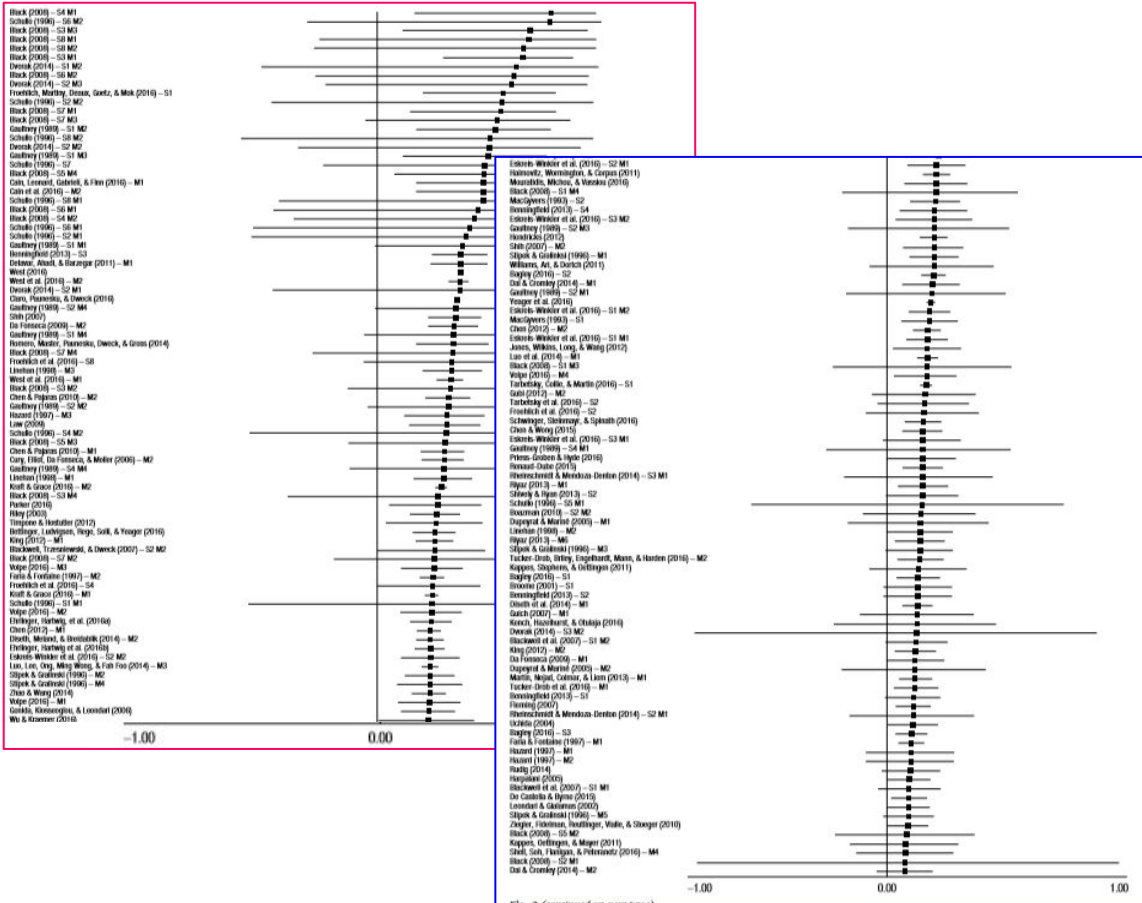
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- 300+ studies
- Heterogeneous effects
- Overall **positive significant** impact



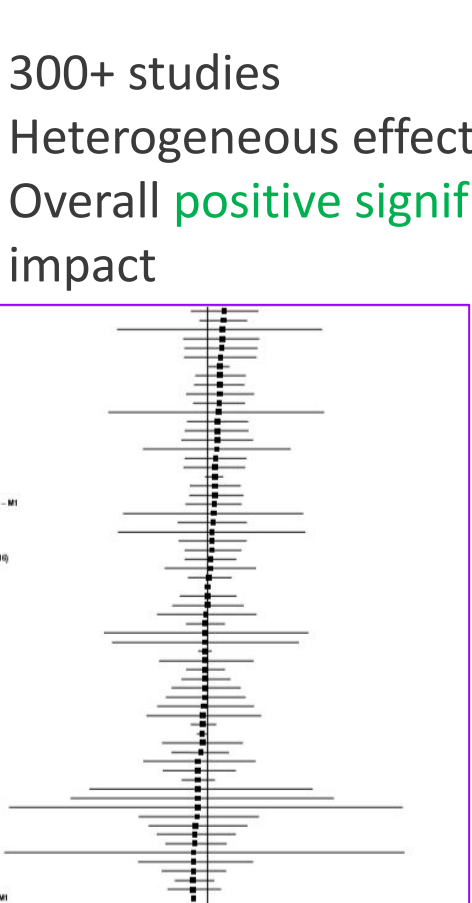
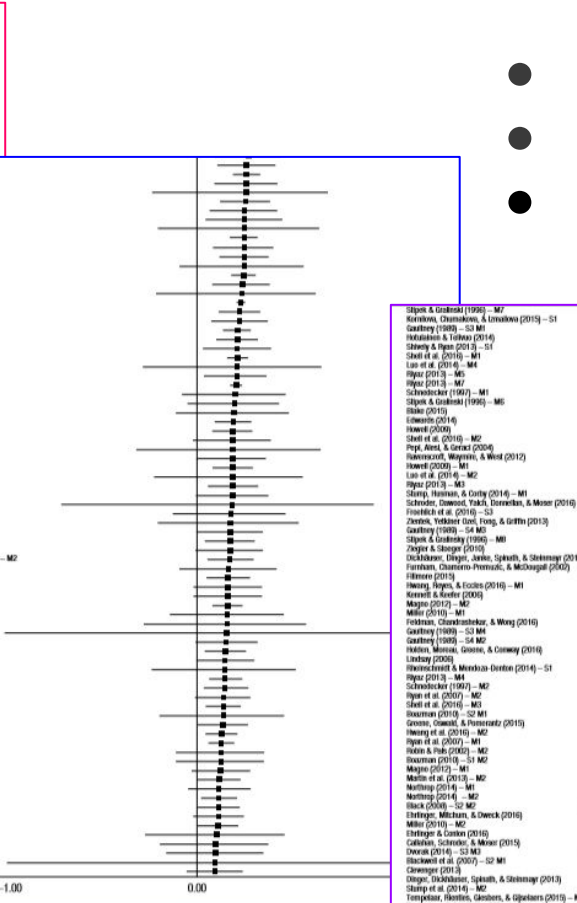
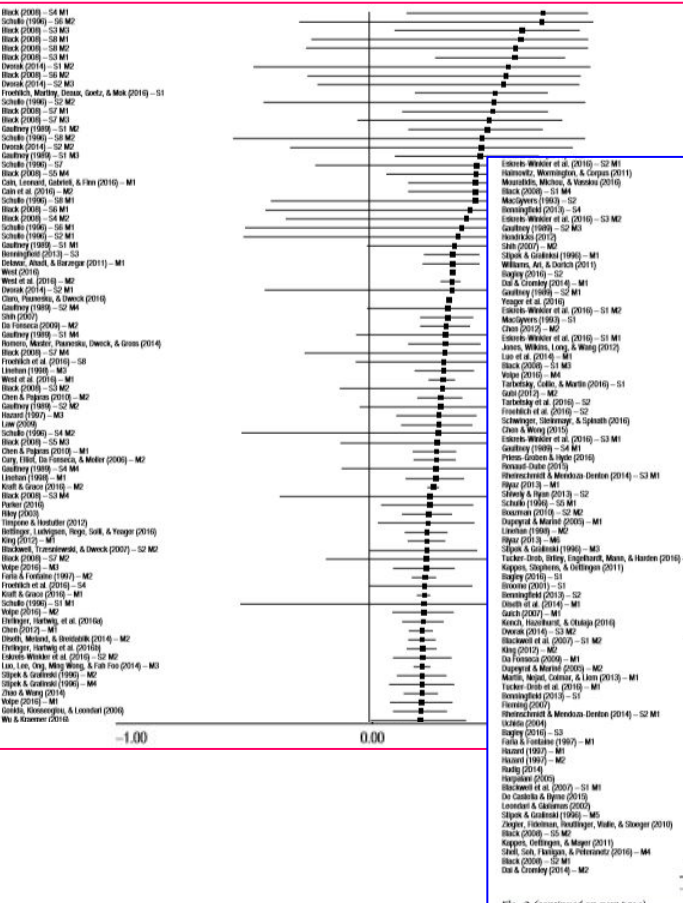
[Sisk, Victoria F. et al. "To What Extent and Under Which Circumstances Are Growth Mind-Sets Important to Academic Achievement? Two Meta-Analyses." *Psychological science* 29.4 \(2018\): 549-571.](#)



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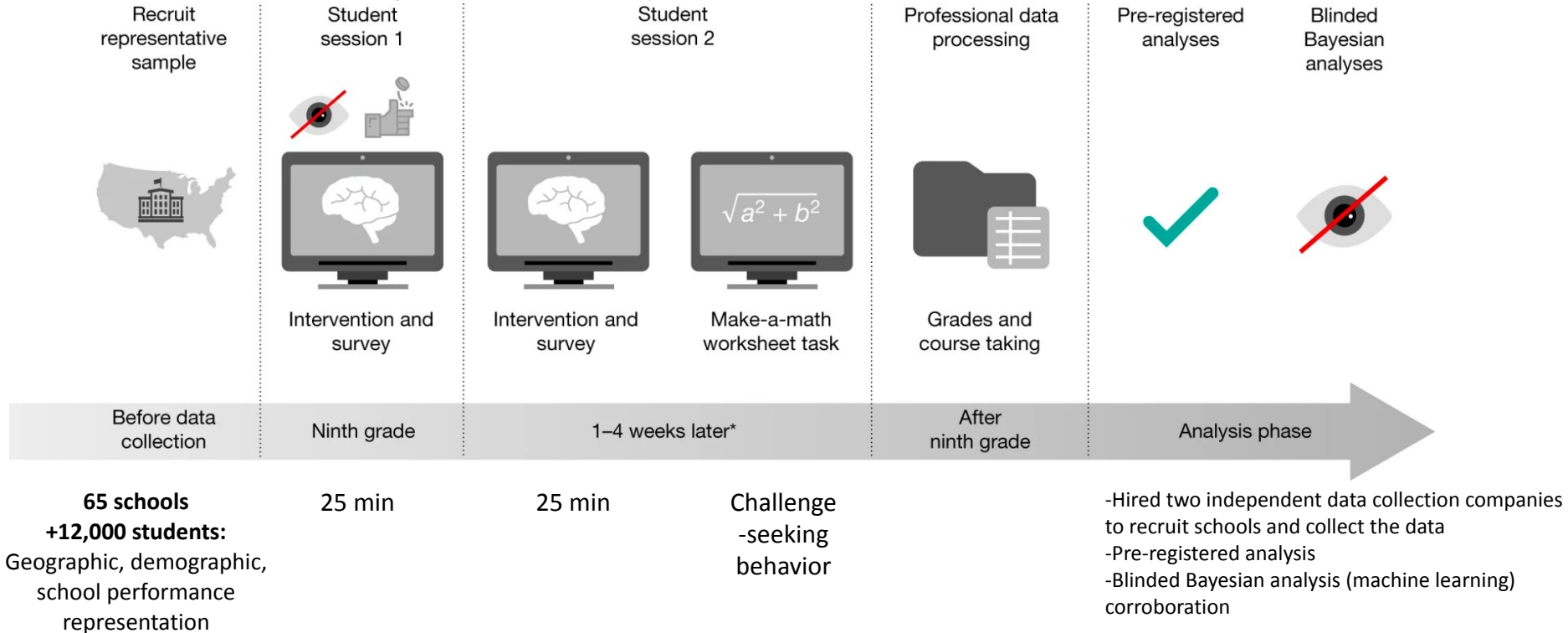
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Motivating questions for Yeager *et al.*, 2019

- Where does this heterogeneity come from?
 - Who benefits most from **growth mindset trainings**?
 - What **conditions** most effectively support the adoption of a growth mindset?
- → Random sample of regular US public high schools makes findings **generalizable** to US population of regular public high schools
- Regular US public high schools
 - Which kinds of **students**...
 - Which kinds of **classrooms**...
 - Which kinds of **schools**...
 - ...benefit most from an online growth mindset training

“PERTS”: Project for Education Research that Scales

A growth mindset intervention that can be delivered at scale (no instructor training/variability)



Session 1: Baseline survey and first intervention session

Week 2-5 of fall semester

Participating students sign into study website...



Baseline survey:

- Demographic measures
- Psychometric measures

Double-blind student-level randomization to intervention or control

Growth mindset intervention:

- Read article on scientific evidence for neural plasticity
- Complete writing exercises to internalize article's lessons

Control condition:

- Read article on localization of brain functions
- Complete writing exercises to summarize article's lessons

Session 2: Second intervention session and follow-up survey

Week 5-10 of fall semester

Participating students sign into study website...



Growth mindset intervention:

- Learn more about how students/celebrities have put a growth mindset into practice
- Complete writing exercises

Control condition:

- Learn about how scientists have studied the brain
- Complete writing exercises to summarize article's lessons

Post-test survey:

- Mindset manipulation checks
- "Make-a-math-worksheet" task
- Fidelity measures

Follow-up: Monitoring academic records to assess whether....

- Previously low-performing students earn higher core subject GPAs
- Previously low-performing students are less likely to show D/F averages
- D/F averages in general are reduced

Study overview

- 9th graders (transitional period, maximal impact)
- Hypothesis: lower-achieving students will benefit the most from growth mindset interventions
 - A growth mindset is most relevant for students who are confronting challenges
 - Impact can be measured in terms of grades (GPA)
 - “Core GPA” = math, science, English, and social studies

Revised intervention framing

1. **Strategies**, not just “**hard work**”: Hard work was previously defined as the opposite of “raw ability”
 - But, working harder without effective learning strategies doesn’t improve learning
 - Ex: “Sometimes people want to learn something challenging, and they try hard. But they get stuck. That’s when they need to try new strategies– new ways to approach the problem.”
2. Support **communal, interdependent values**
 - “*You can grow your intelligence*” may have emphasized independence too much
 - Goal: to remove stigma around asking for help
 - Ex: “People tell us that they are excited to learn about a growth mindset because it helps them achieve the goals that matter to them **and to people they care about**. They use the mindset to learn in school so **they can give back to the community and make a difference in the world later.**”
3. Aligning **peer norms**
 - Ex: “People everywhere are working to become smarter. They are starting to understand that struggling and learning are what put them on a path to where they want to go.”
4. Leverage **adolescent resistance**, growth mindset as a response to adult control
 - Include this quote from an upper-class student: “I hate how people put you in a box and say ‘you’re smart at this’ or ‘not smart at that.’ After this program, I realized the truth about labels: they’re made up... Now I do not let other people box me in... It’s up to me to put in the work to strengthen my brain.”

Revised intervention framing: “Indirect” rather than “Direct” Framing

- Direct (“this will help you.”)

- “Why does getting smarter matter? Because when people get smarter, they become more capable of doing the things they care about. Not only can they earn higher grades and get better jobs, they can have a bigger impact on the world and on the people they care about. In this program, you’ll learn what science says about the brain and about making it smarter.”

- Indirect (“this will help others.”)

- “Students do a great job explaining ideas to their peers because they see the world in similar ways. On the following pages, you will read some scientific findings about the human brain. *We would like your help to explain this information in more personal ways that students will be able to understand. We’ll use what we learn to help us improve the way we talk about these ideas with students in the future.*”

Revised intervention (Yeager *et al.*, 2016)

Original intervention: 3-part structure

1. Read “You Can Grow Your Intelligence” (4 pgs.)
 - Your brain can get smarter the more it is challenged, like a muscle, because of phenomena like neuroplasticity.
2. Describe a personal experience of learning something
3. Write a letter to a future student who is struggling and may feel “dumb.” (“Saying is believing” exercise)

Original

You Can Grow Your Intelligence
New Research Shows the Brain Can Be Developed Like a Muscle


Many people think of the brain as a mystery. They don't know much about intelligence and how it works. When they do think about what intelligence is, many people believe that a person is born either smart, average, or dumb—and stays that way for life.

But new research shows that the brain is more like a muscle - it changes and gets stronger when you use it. And scientists have been able to show just how the brain grows and gets stronger when you learn.

Everyone knows that when you lift weights, your muscles get bigger and get stronger. A person who can't lift 20 pounds, when they start exercising can get strong enough to lift 100 pounds after working out for a long time. That's because the muscles become larger and stronger with exercise. And when you stop exercising, the muscles shrink and you get weaker. That's why people say, "Use it or lose it!"

But most people don't know that when they practice and learn new things, parts of their brain change and get larger, a lot like muscles do when they exercise.

Inside the cortex of the brain are billions of tiny nerve cells, called neurons. The nerve cells have branches connecting them to other cells in a complicated



network. Communication between brain cells is what allows us to think and solve problems.

When you learn new things, the tiny connections in the brain actually multiply and get stronger. The more that you challenge your mind to learn, the more your brain cells grow. Then, things that you once found very hard or even impossible to do - like speaking a foreign language or doing algebra—seem to become easy. The result is a stronger, smarter brain.

Revised


HOME »

< Go Back Section 2: About the Brain

News About the Brain

In this program you will learn about an important scientific finding:

The brain is like a muscle—it gets stronger (and smarter) when you exercise it. You exercise your brain by working on challenging material that makes you think hard.



[Continue](#)

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<https://www.perts.net/orientation/hg>

Growth Mindset for 9th Graders

A free, evidence-based program designed to increase students' engagement, motivation, and ultimately success by laying the foundation for a growth mindset.

Free for all high schools

GET STARTED

STUDENTS ENTER HERE

Already registered? Sign in

<https://www.perts.net/orientation/cg>

Growth Mindset for College Students

A free, evidence-based program designed to increase students' engagement, motivation, and ultimately success by laying the foundation for a growth mindset.

Free for all 2- and 4-year colleges

GET STARTED

and <https://mindsetscholarsnetwork.org/>

- Two 25-min online sessions, about 3 weeks apart
- Session 1 (25 Minutes):
 1. Students a quick **survey** assessing their mindsets and related attitudes and about their school environment.
 2. Students complete the first part of the interactive growth mindset activity about neural plasticity, strategies for growing their intelligence, and stories from other students.
 3. Students then complete writing exercises where they are asked to help us explain the concept to other students

< Go Back Survey Section

Read each sentence below and mark the choice that shows how much you agree or disagree with it. There are no right or wrong answers.

You can learn new things, but you can't really change your basic intelligence.

Strongly Disagree Disagree Somewhat Disagree Somewhat Agree Agree Strongly Agree

Your intelligence is something about you that you can't change very much.

Strongly Disagree Disagree Somewhat Disagree Somewhat Agree Agree Strongly Agree

Survey Section

How much do you agree or disagree with this statement?

When you have to try really hard in a subject in school, it means you can't be good at that subject.

Strongly disagree Disagree Mostly disagree Mostly agree Agree Strongly agree

Continue

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News About the Brain


This program shares three scientific findings.

First, the brain is like a muscle—it gets stronger (and smarter) when you exercise it. You exercise your brain by working on material that makes you think hard in school.

Second, 9th grade is a perfect time to grow your brain. Science shows that the cells in the teenage brain are especially ready to grow stronger when you learn.

And third, building a stronger brain in high school can help you become the person you want to be. It can help you make a difference for your family, community, or the world around you.

[Learn More](#)



Your brain learns when you...

Work hard on your writing and math assignments...


And gain writing and math skills that you can use in the future...

and this helps you to...

Make a difference for your family, community, or the world around you

Stronger Connections Make a Smarter Brain

The connections between neurons can be weak or strong. When you work hard to learn something new—like a new type of math problem—the connections in your brain get stronger.



The brain's connections also get stronger when you practice basic skills. Over time, these stronger connections can make you smarter in a subject.

[Continue](#)

Not just about working hard (a common oversimplification)

Section 4: Strategies

It's Not Just About Effort: Use the Right Strategies

Sometimes people want to learn something challenging, and they try hard. But they get stuck. It won't help your brain if you just keep doing the same thing that didn't work, over and over again. That's when they need to try new strategies—new ways to approach the problem.

Here are three things that can be helpful when you're stuck on a tough problem.

Which ones have you ever done before?

Select all that apply.



Ask a student who knows how to do the problem for ideas



Ask your teacher for suggestions about how to get un-stuck



Step back and try a new approach on the problem

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Kayla L., high school student

*People always say that we're supposed to use our brains. But they don't always tell us how to do it, and they don't ask us what our personal reasons for learning are—like, what makes us want to use our brains. **I'm glad somebody finally took the time to explain things, and to ask for my opinion.** For me, I want to have a good life. I also want to help my family and make my community better. I like how somebody finally cared enough to ask me what I thought.*

Continue

- Two 25-min online sessions, about 3 weeks apart

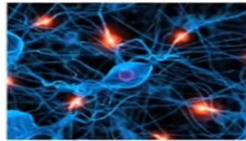
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Share Your Own Experience

To help future students understand these basic facts, please share another one of your experiences.

What is a time you grew stronger connections in your brain? Think about a time you had to work really hard to get better at something in school: maybe it was a new kind of writing assignment or a math problem that seemed really hard at first.



Connected neurons in the brain

What was a time you made your brain stronger in school?

Please write 1-2 sentences.

I learned to calculate area and perimeter and distinguish between the two concepts.]

Help Us Explain This to Other Students

This is where we really need your input. Think about new students coming to 9th grade next year. Imagine a student who is struggling in one of their classes and is feeling discouraged. Maybe the work feels too hard for them, or maybe they are having trouble staying motivated.



What is the most important thing (or things) you learned today that could help them?

For example, you can tell them:

- Just because a subject is hard doesn't mean you're "not smart" at it.
- You can ask the teacher or other students for ideas when you get stuck.
- When you work on challenging assignments, your brain is getting smarter and stronger.

Session 2 (25 min): Reinforce and Extend

- Reminder of lessons from Session 2
- **Community values-** motivate changing their mindset
- Read responses from other students

Warm-Up Question

When people have a stronger brain, they're ready to do things that matter to them. And if we want to explain this to next year's students, we need to learn what kinds of issues matter to you. Please answer this question:

What issues matter most to you personally? You could write about helping people you care about. You could write about things in your community or the world that need attention—like helping children learn, helping people get jobs, treating people equally, stopping violence, or just helping people be healthy and happy. Or you could write about any other way that things could be better.

Try especially to think of something where having a stronger brain might help a person like you make a difference for the issue one day.



Please write 2-3 sentences.

A stronger brain might develop ways for a more equitable world.

Synthesize it into a Plan

- Students asked to synthesize ideas and apply them to their own life

Please answer this question: **How might you use a learning mindset more in your classes?**

For instance, you could write about using a learning mindset when math class is hard, or when a teacher tells you how to improve your writing. As a reminder, when students use a learning mindset they:

- Welcome challenges and stick to them
- Try new strategies
- Ask for advice when they are stuck
- Use their mistakes to learn and improve

In the box, please share your plan for using a learning mindset. We'll share these with future students.

Please write 1-2 sentences.

Work SMART. Use a stra||

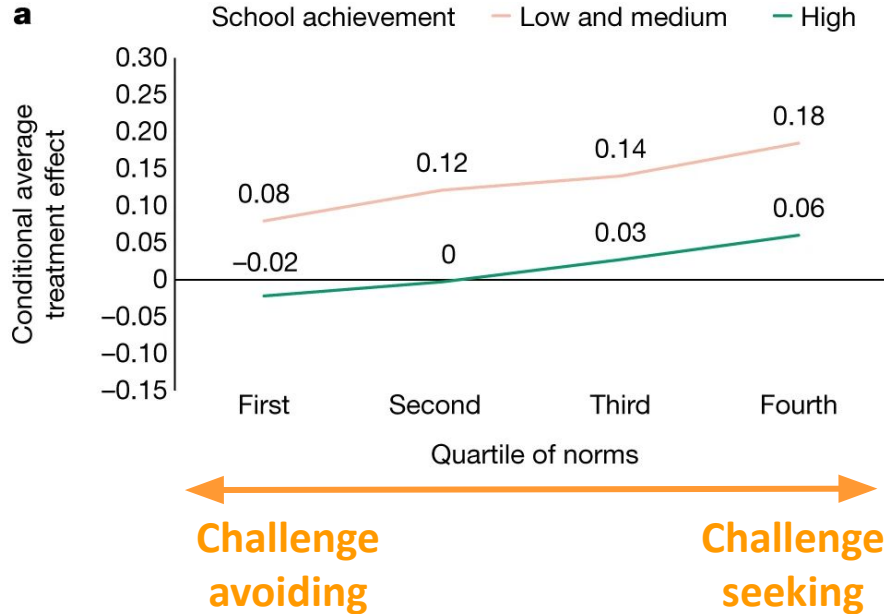
Overall results

Extended Data Table 1 | Growth mindset effects were of a similar magnitude across subject areas

| Outcome | Growth mindset intervention effect | | | | |
|--|------------------------------------|------------------|---------------|----------|----------|
| | <i>B</i> | 95% CI | <i>t</i> (46) | <i>p</i> | <i>n</i> |
| Lower-achieving students (<i>pre-registered group of interest</i>) | | | | | |
| Fixed mindset | -0.381 | [-0.456, -0.301] | -10.141 | <.001 | 5651 |
| Core course GPA | 0.101 | [0.04, 0.16] | 3.508 | .001 | 6315 |
| Math GPA | 0.086 | [-0.01, 0.18] | 1.827 | .074 | 5900 |
| Science GPA | 0.124 | [0.07, 0.18] | 4.220 | .000 | 5834 |
| English GPA | 0.105 | [0.02, 0.19] | 2.464 | .018 | 6096 |
| Social Studies GPA | 0.094 | [0.02, 0.17] | 2.401 | .020 | 4800 |
| Students overall | | | | | |
| Fixed mindset | -0.420 | [-0.425, -0.337] | -18.686 | <.001 | 11351 |
| Core course GPA | 0.052 | [0.03, 0.08] | 3.796 | <.001 | 12486 |
| Math GPA | 0.063 | [0.03, 0.01] | 3.556 | .001 | 11539 |
| Science GPA | 0.072 | [0.04, 0.10] | 4.811 | <.001 | 11585 |
| English GPA | 0.042 | [-0.01, 0.09] | 1.767 | .084 | 12045 |
| Social Studies GPA | 0.037 | [0.00, 0.07] | 2.022 | .049 | 9899 |

- The GM intervention **decreased fixed-mindedness** in students overall and lower-achieving students
- Lower-achieving students had the **biggest impact in their grades**

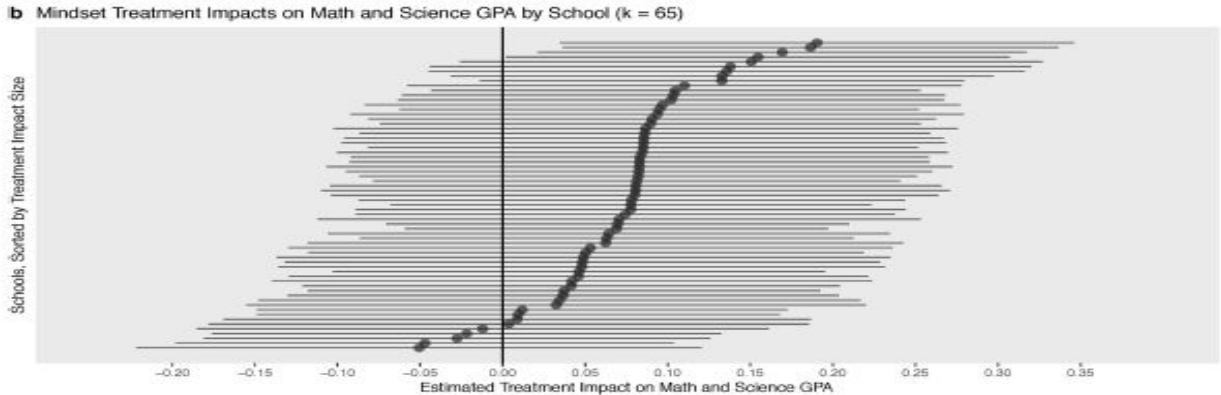
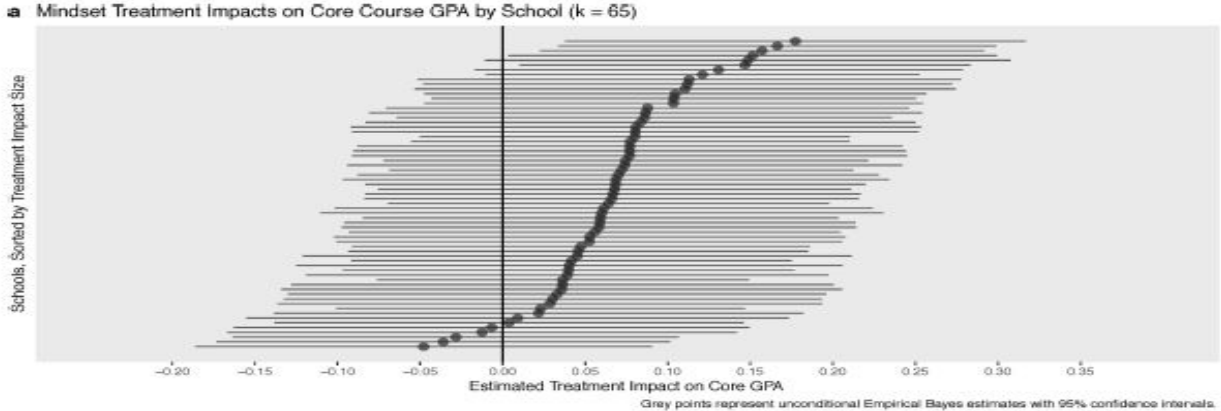
Further breakdown:



“Make-a-math” worksheet:
Students chose from math problems that were described either as *challenging and offering the chance to learn a lot* or *as easy and not leading to much learning*.

- CATE: “Conditional Average Treatment Effect” for grades
→ **How can we help our students cultivate supportive, challenge-seeking norms?**

Per school, GM effect is almost always positive



How can we help our students develop a
growth mindset?

Design strategies that promote a **growth mindset** in your students

1. Destigmatize mistakes and challenges
2. Optimize feedback giving (you) and receiving (your students)
3. Challenge the notion that learning does not require struggle.
4. Communicate that abilities can grow.

Work with your neighbors for 5-7 min:

- Discuss how the provided strategies for your **assigned category** promotes students' growth mindset.
- Come up with specific strategies for your category to encourage a growth mindset in your students.
- Be prepared to share out to the group. (Person whose last name is earliest in the alphabet.)

1. Destigmatize mistakes & challenges

Using examples of others who have struggled

Journal of Educational Psychology

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0022-0663/16/\$12.00 <http://dx.doi.org/10.1037/edu0000092>

Even Einstein Struggled: Effects of Learning About Great Scientists' Struggles on High School Students' Motivation to Learn Science

Xiaodong Lin-Siegler and Janet N. Ahn
Teachers College, Columbia University

Jondou Chen
University of Washington

Fu-Fen Anny Fang and Myra Luna-Lucero
Teachers College, Columbia University

Journal of Educational Psychology

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0022-0663/11/\$12.00 DOI: 10.1037/a0026224

How Learning About Scientists' Struggles Influences Students' Interest and Learning in Physics

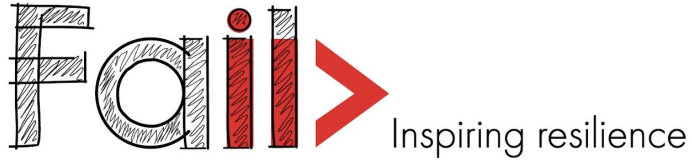
Huang-Yao Hong
National Chengchi University

Xiaodong Lin-Siegler
Columbia University

How does learning about scientists' struggles during their scientific knowledge building affect students' science learning? Two hundred and seventy-one high school students were randomly assigned to 1 of 3 conditions: (a) the struggle-oriented background information ($n = 90$) condition, which presented students with stories about 3 scientists' struggles in creating the content knowledge that the students were learning through online physics instructional units; (b) the achievement-oriented background information ($n = 88$) condition, in which students learned about these 3 scientists' lifetime achievements; and (c) a

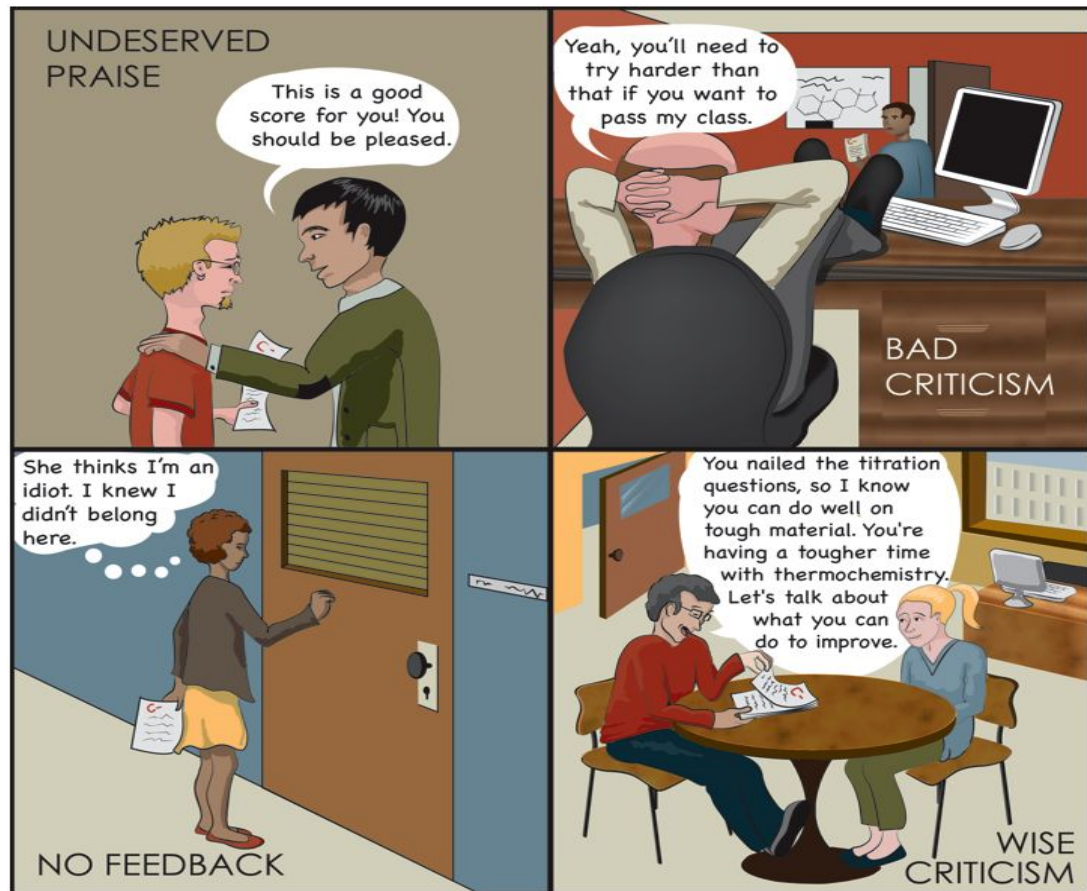
1. Destigmatize mistakes & challenges

Using examples of others who have struggled



https://www.youtube.com/channel/UC1Z9a0Pdx4vF3O9_HofRBw

2. Optimize feedback giving (you) & receiving (your students)



Cathy Drennan's TA Training Bootcamp


<http://drennan.mit.edu/education/education-interests/teacher-and-mentor-training/>

2. Optimize feedback giving (you) & receiving (your students)

Wise criticism

high standards + suggestions for improvement

Wise feedback:
I'm giving you these comments because I have high standards and I know that you can meet them.



7 edits

1 *2* *3*

define love

where?

what do you mean by testimony? freedom to fight for what?

say more about the change

use this in the essay.

twice for someone no longer living

give me detail - use the article

good - use this earlier w/ courage maybe

First Dr. Martin Luther King Jr. has courage. He did not have to speak for "his people" but he did it because he cares. King led some civil rights movements in his time. Dr. King also gave a speech in front of 200,000 of his supporters.

Second Dr. Martin Luther King is a testimony to me and others. He is a testimony to me because he did everything he could do to fight for the freedom for him, his family, and others. Now when I look at the simplest things and complain I think of what Dr. King would do.

Finally Dr. King is my hero because when he was tested he did not complain instead he overcame the worst. Dr. King had many good reasons to quit what he was doing and curse everyone, but he didn't. In the worst of times Dr. King kept his chin up. When King's home was bombed all he said was "We must learn to meet hate with love" Dr. King was a great man and he helped change our world as we know it.

In conclusion Dr. Martin Luther King Jr. is my hero because he had courage. He is a testimony to me and to others. Also he overcame his troubles when he was tested.

"I have a dream that little black boys and little black girls will be able to join hands with little white boys and little white girls and walk together as sisters and brothers."

Assurance and Wise Feedback

*Convey respect for students as **individuals**, rather than judging them in light of a negative stereotype. Use feedback primarily as a mechanism to **help** students improve.*

Give “wise” feedback to encourage students:

- Feedback reflects teachers’ **high standards**
- Feedback confirms the belief that **the student can achieve** those high standards
- Feedback provides **concrete guidance** for student improvement

2. Optimize feedback giving (you) & receiving (your students)

Teach students how to handle & learn from feedback

A. Dismantle distortions:

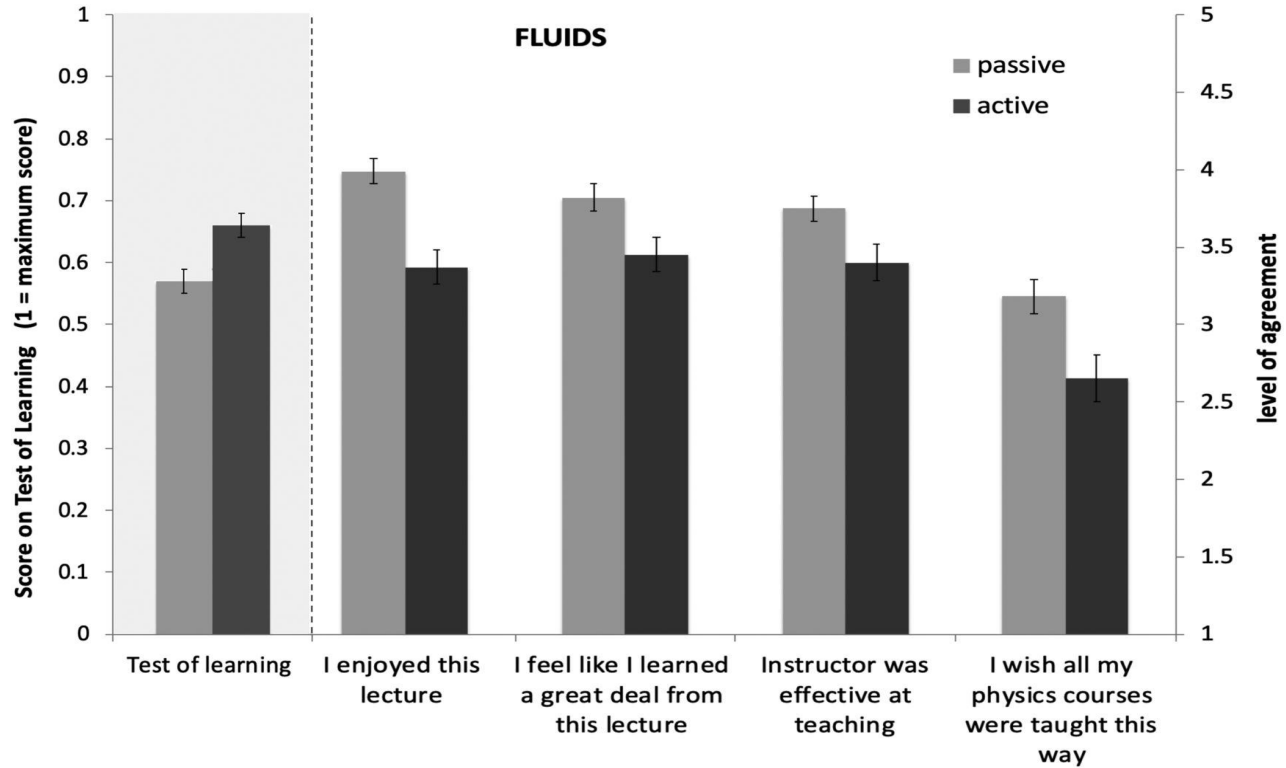
contain the story

| What <i>is</i> this about? | What <i>isn't</i> this about? |
|---|--|
| Whether I might have the qualifications the internship program/fellowship is looking for. | Whether I might not get to work in this company or a good company in the future. |

- change your vantage point:
 - imagine you're an observer/friend
 - look back from the future

B. When critical feedback is provided → **lean into taking a coaching approach**

3. Challenge the notion that learning does not require struggle.



“Illusion of Knowing”

3. Challenge the notion that learning does not require struggle.

“Desirable difficulties”

Retrieval practice:

- encouraging students to test themselves rather than review problems/content while studying
- implementing weekly classroom quizzes

Space & interleave practice:

- interleaving problem types rather than practicing solving same type of problems

4. Communicate that abilities can grow.

Teaching students about neuroplasticity

Psychological Science OnlineFirst, published on April 10, 2013, doi:10.1177/0956797612450717



Psychological Science
in The American
Psychological Association
Regular and special
issues
SAGE

Research Article

Mind-Set Interventions Are a Scalable Treatment for Academic Underachievement

David Paunescu¹, Gregory M. Walton¹, Carlissa Romero¹, Eric N. Smith¹, David S. Yeager², and Carol S. Dweck¹

Abstract

The efficacy of academic mind-set interventions has been demonstrated by small-scale, proof-of-concept interventions, generally delivered in person in one school at a time. Whether this approach could be a practical way to raise school achievement on a large scale remains unknown. We therefore delivered brief growth-mind-set and some-of-purpose interventions through online modules to 1,584 students in 13 academically diverse high schools.



Applied Developmental Psychology 24 (2003) 645–662

Improving adolescents' standardized test performance: An intervention to reduce the effects of stereotype threat

Catherine Good^{a,*}, Joshua Aronson^{b,1}, Michael Inzlicht^a

^aDepartment of Psychology, Columbia University, 405 Schermerhorn Hall, 1190 Amsterdam Avenue, New York, NY 10027, USA

^bNew York University, East Building, 239 Greene Street, 537F, New York, NY 10003, USA

Abstract

Standardized tests continue to generate gender and race gaps in achievement despite decades of national attention. Research on "stereotype threat" (Ostle & Aronson, 1995) suggests that these gaps may be partly due to stereotypes that impugn the math abilities of females and the intellectual abilities of Black, Hispanic, and low-income students. A field experiment was performed to test methods of helping female, minority, and low-income adolescents overcome the anxiety-inducing effects of stereotype threat and, consequently, improve their standardized test scores. Specifically, seventh-grade students in the experimental conditions were mentored by college students who encouraged them either to view intelligence as malleable or to attribute academic difficulties in the seventh grade to the novelty of the educational setting. Results showed that females in both experimental conditions earned significantly higher math standardized test scores than females in the control condition. Similarly, the students—who were largely minority and low-income adolescents—in the experimental conditions earned significantly higher reading standardized test scores than students in the control condition.

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Keywords: Stereotype threat; Adolescents; Standardized tests; Mathematics; Reading; Gender differences; Low-income students; Minority students; Attributions; Beliefs about intelligence

Journal of Educational Psychology

THE AMERICAN PSYCHOLOGICAL ASSOCIATION

How Learning About Scientists' Struggles Influences Students' Interest and Learning in Physics

Huang-Yao Hong
National Central University

Xiaodong Lin-Sieglar
Columbia University

How does learning about scientists' struggles affect their scientific knowledge building efforts? In a science lessoning 170 students and one year of high school students, we examined the role of background information on students' interest and learning in physics.

Students with written about a scientist's struggle in reading the control lessoning through online physics instruction. In the intervention lessoning, students read a lessoning on background information (N = 93) condition, a control group condition, and a control group condition. The intervention condition included information about the physics content they were studying. The control condition included information about the physics content they were studying. The intervention condition included information about the physics content they were studying. The control condition included information about the physics content they were studying.



ELSEVIER

A major goal of this study is to explore how learning about scientists' personal backgrounds, particularly how scientists struggle during their scientific knowledge building, affects students' interest and learning in science. This motivational approach is different from many efforts to increase students' motivation to learn by creating instructional materials (e.g., textbooks or computer-based instructional materials) that are more interesting, fun, or engaging for students. For instance, many science textbooks incorporate stimulating illustrations or virtual images in order to maintain students' interest and learning in science. This motivational approach is different from many efforts to increase students' motivation to learn by creating instructional materials (e.g., textbooks or computer-based instructional materials) that are more interesting, fun, or engaging for students. For instance, many science textbooks incorporate stimulating illustrations or virtual images in order to maintain students' interest and learning in science.

Keywords: scientist's struggles; personal background information; key concepts; scientific motivation

Journal of Educational Psychology

THE AMERICAN PSYCHOLOGICAL ASSOCIATION

How Learning About Scientists' Struggles Influences Students' Interest and Learning in Physics

Huang-Yao Hong, Department of Education, National Central University, Taiwan, Taiwan; Xiaodong Lin-Sieglar, Department of Psychology, Columbia University, New York, New York

Support for writing this article was provided, in part, from National Science Council Grant 99-2311-A-001-003-MY3 by Huang-Yao Hong and National Natural Science Foundation Grant 00043001 by Xiaodong Lin-Sieglar.

Correspondence concerning this article should be addressed to Huang-Yao Hong, Department of Education, National Central University, Section 2, Zhi-Nan Road, Wuhan District, Taipei 10616, Taiwan. E-mail: hph@ncu.edu.tw

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Keywords: Stereotype threat; Adolescents; Standardized tests; Mathematics; Reading; Gender differences; Low-income students; Minority students; Attributions; Beliefs about intelligence

Journal of Experimental Social Psychology 38, 113–125 (2002)
doi:10.1006/jesp.2003.1491, available online at <http://www.idealibrary.com on>

Reducing the Effects of Stereotype Threat on African American College Students by Shaping Theories of Intelligence

Joshua Aronson
New York University

Carrie B. Fried
Western State University

Received March 23, 2002; revised May 14, 2002; accepted June 11, 2002

African American college students tend to obtain equivalent test scores. Past research suggests that this is due to their underperformance. Awareness of these "stereotype threat" (Steele & Aronson, 1995), which is a psychological phenomenon that impairs performance on tests of intelligence. This research was designed to investigate whether and how these students' self-perceptions of their intelligence could be improved. In two experiments, we tested whether a brief intervention that encouraged students to view intelligence as malleable rather than as a fixed trait could improve their test scores. Results showed that students who received the intervention performed significantly better on the test than those who did not. This finding has important implications for the design of educational programs, in particular, and for the design of interventions to improve the academic achievement of African American students.

© 2002 by the American Psychological Association

Keywords: stereotype threat; African American students; intelligence; self-perceptions; academic achievement

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THE AMERICAN PSYCHOLOGICAL ASSOCIATION

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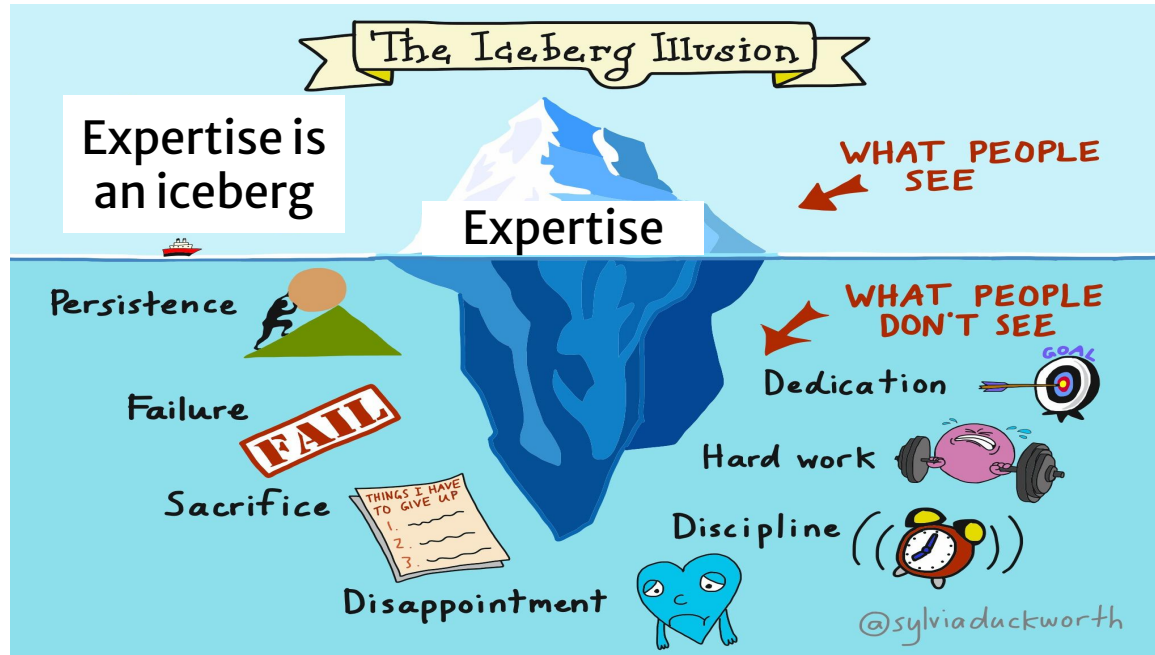
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What are other ways to communicate that abilities can grow and expand provided the right experiences?

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4. Communicate that abilities can grow.

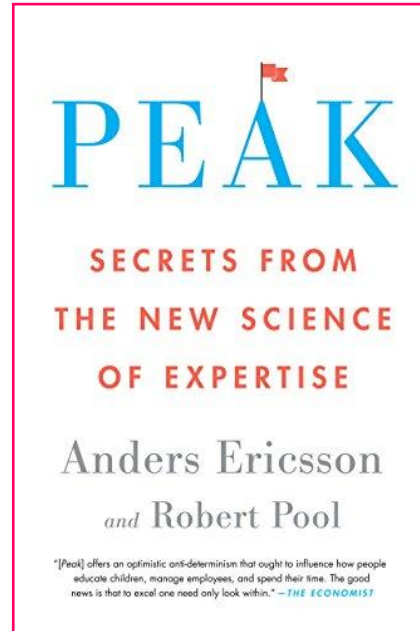
Explain how expertise is acquired



4. Communicate that abilities can grow.

Explain how expertise is acquired

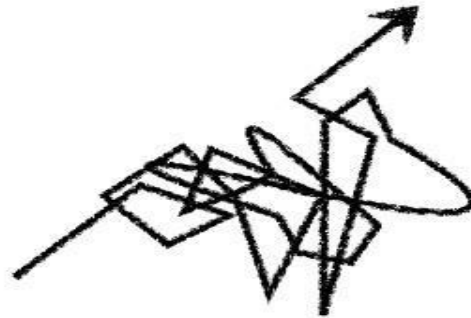
Deliberate practice: activity that one engages in with the purpose of improving performance.



Mastery



what people think it
looks like

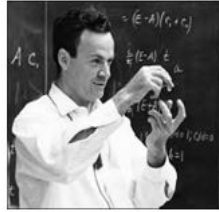


what it **actually**
looks like

The Nature of Science, and of LPSA

- **Questions** and **Problems**

“Know how to solve every problem that has been solved” – Richard Feynman



Richard Feynman

- **Collaboration** and **Solidarity**

“If I have seen further it is by standing on the shoulders of giants.” – Isaac Newton



Prof. John Johnson
(Astro 16)

- **You!**

“We look at science as something very elite, which only a few people can learn. That's just not true.” - Mae Jemison



Mae Jemison (Astronaut)

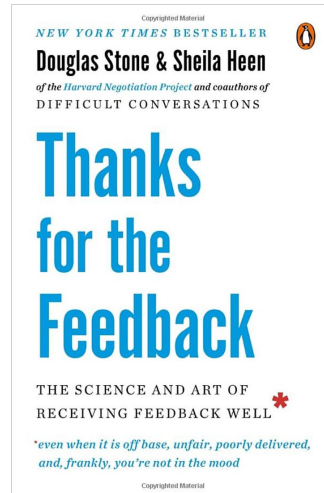
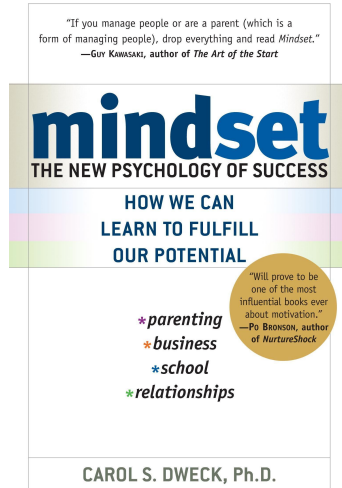
- Normalizing struggle and challenges
- Motivate students to support one another
- Set high expectations

Strategies to promote a growth mindset in your students

1. Destigmatize mistakes and challenges
2. Optimize feedback giving (you) and receiving (your students)
3. Challenge the notion that learning does not require struggle.
4. Communicate that abilities can grow.
5. **Continue on your own mindset journey**

Resources

- Mindset Scholars Network: <http://mindsetscholarsnetwork.org/>
- Project for Education Research That Scales: <https://www.perts.net/>
- Quick intro: Carol Dweck's TED talk
- More in-depth resources:



Guiding principles we can use

1. **Offer Process praise** instead of **person praise**
 - **Process praise** emphasizes student effort and strategy use ☐ student resilience
 - **Person praise** ties their performance to their sense of self-worth ☐ making a mistake implies they are not smart
2. **Skill-** Teach strategies for successfully taking on challenging tasks that extend the frontiers of students' current ability.
3. **Resilience-** Create a culture of high expectations and safety that enables students to be resilient academic risk takers.
 - Convey confidence that your students can meet high expectations, and help them not get too down when they are challenged.
 - Making challenging oneself the norm.
 - Teach students to support each other.
4. **Assessment-** Teach students the real value of assessments and how they can be used for improvement.
 - teach students how to use tests to identify areas for growth and learn from mistakes
 - Help students use homework and tests to identify where they are in their learning, and where they need to be.
 - Encourage revisions so they can develop mastery

Thank you!

Stay in touch and let us know how we can help!

- Farber 2
- ctl@brandeis.edu
- msamuels@brandeis.edu
- [CTL Events page](#)
- Keep an eye out for our CTL Newsletter!

Weekly CTL Teaching+Learning Lunches

Spring 2023

All Brandeis faculty, graduate students, and post docs are invited to attend our weekly T+L Lunches:

- **Workshops** explore specific topics of teaching and learning with practical applications (hybrid format);
- **Journal Clubs** discuss recent pedagogical research and its applications for your classroom practice (hybrid format); and
- **Salons** foster collegial conversations about teaching and learning (in-person).

T+LL Workshop: Active Learning

January 27, 2023

Friday, 12:30 - 1:50 pm, Goldfarb Gardner Jackson

Research has shown that active learning significantly improves student learning, but how can we best incorporate it into our classes? In this workshop, we will discuss a variety of easy-to-implement active learning techniques from a variety of disciplines, and discuss how to apply some recent research about what makes active learning work best and how to get student buy-in.

Facilitator: Dr. Marty Samuels

PLEASE RSVP HERE IF YOU PLAN TO ATTEND IN-PERSON TO RESERVE YOUR LUNCH SPOT.

PLEASE REGISTER TO RECEIVE A ZOOM LINK IF YOU PLAN TO ATTEND ON-LINE.

...and please feel free to attend even if you don't RSVP!

T+LL Salon

February 3, 2023

Friday, 12:30 - 1:50 pm, Goldfarb Gardner Jackson

Join colleagues for discussions about learning and teaching. These informal conversations are about issues that interest you -- or with which you are wrestling. We'll follow your lead, but we always have good topics on tap if there's nothing on your mind at the moment. Bring a friend (or two)!

Facilitator: Dr. Dan Perlman

PLEASE RSVP HERE TO RESERVE YOUR LUNCH SPOT.

...and please feel free to attend even if you don't RSVP!

T+LL Journal Club: Helping your Students to Think Like Experts

February 10, 2023

Friday, 12:30 - 1:50 pm, Goldfarb Gardner Jackson

What is expertise, and what does it look like in your discipline? In this journal club, we'll discuss recent literature about what distinguishes experts and novices in various disciplines, and how we can approach teaching as a way to help students become more like an expert, one semester at a time.

Facilitator: Dr. Marty Samuels

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PLEASE REGISTER TO RECEIVE A ZOOM LINK IF YOU PLAN TO ATTEND ON-LINE.

...and please feel free to attend even if you don't RSVP!

T+LL Workshop: Using Growth Mindset to Improve Teaching and Learning

February 17, 2023

Friday, 12:30 - 1:50 pm, Goldfarb Gardner Jackson

Growth mindset—the belief that your skills and intelligence are malleable and can be improved with hard work and practice—has been shown to be a vital aspect of learning. In this session, we will focus on developing a growth mindset for ourselves and for our students, and why both are important. It is often all too easy to think of ourselves as finished products with set skills, but this can hinder our attempts to be willing to learn new knowledge and skills. Fostering a "growth mindset" can motivate us—and our students—to focus on the process of learning, to embrace challenges as learning opportunities, and to improve our abilities through practice. Teaching students to have a growth mindset has been shown to improve student performance and reduce achievement gaps between student groups, and in this workshop we'll discuss how to put some of these principles into practice in our classrooms.

Facilitator: Dr. Marty Samuels

PLEASE RSVP HERE IF YOU PLAN TO ATTEND IN-PERSON TO RESERVE YOUR LUNCH SPOT.

Opening reflection activity

Think about something in your academic past that you think measured you. For example:

- a test score
- not getting an internship
- a meeting where your research work was ripped to shreds
- a disparaging comment from a professor/advisor

1. Write down (**on one side of index card**):

the scenario in question and how it made you feel about your own abilities.

Opening reflection activity

Think about something in your academic past that you think measured you. For example:

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1. Write down (on one side of index card):

the scenario in question and how it made you feel about your own abilities.

2. Re-examine your experience of failure. Answer (on the other side of index card):

What can I learn from that experience? How can I use it as a basis for growth?