Brainology across Subject Domains

In order to develop a Growth Mindset school culture, all of your students’ teachers need to be familiar with the skills, concepts, and language of the Brainology program, and embed them in their content area teaching.

Here are **10 essential questions** that can become a cornerstone of your interactions with students:

1. Am I a learner?
2. How does my brain work?
3. How does learning change my brain?
4. Can I grow what I know?
5. Am I persistent in solving problems?
6. Do I seek or avoid challenges?
7. How do I know I am doing my best?
8. Is this an opportunity to learn?
9. Why are mistakes wonderful?
10. Do I have a growth mindset?

You can supplement the activities and assessments embedded in the Brainology curriculum with reflective writing assignments several times during the year. These reflective activities provide students with an opportunity to revisit the various ideas, concepts and skills associated with the Brainology program. They can also give teachers and administrators evidence of student learning.

Following are three examples of reflective writing assignments:

1. Unpack each of the 10 essential questions and have students discuss and reflect on each question in depth. Ask students to write about how one or more of these questions relates to their academic subjects and to their life outside of school.

2. Provide students with the following question and prompt: "Do you possess a growth mindset (Yes or No)? In one brief paragraph, cite examples from your life in or out of school to support your response." Then share and discuss with your students’ teachers so they can use them as entry points into conversations with students around their work in school.

3. Have students do the Mindset Profile Survey again after they have finished the Brainology program, and ask them to respond to three questions [one paragraph per response]:
   a. How has your mindset changed from the beginning of the school year? Use your survey results as a guide and reflect on your growth this year.
   b. What steps have you taken to shift your mindset this year?
   c. How will you continue to develop your growth mindset in the future?

Students’ work can be collected in a Brainology binder and/or displayed on a Growth Mindset bulletin board.
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The Recipe to GROW your brain

Eat a balanced diet with leafy greens, eggs, nuts, fish, & lots of water!

Sleep 9-10 hours EVERY night!

Get Your exercise!

Use your calming strategies!

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R. epeat
A. ction
I. nformation search
N. ever give up!

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N. R. B.

I.
Information ANY
reak epeat ction
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✓ You can grow MORE all the time!
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Use your strategies...

Square Breathing

Visualization

Positive Self-Talk

Avoid Fight or Flight Syndrome!

www.mindsetworks.com
Calm Brains Learn! Use your strategies...

Avoid Fight or Flight Syndrome!

More practice will get me there!
How to build intelligence

You set a goal, become motivated and begin to explore a new concept or skill. A new neuron is formed through a process called neurogenesis.

You see, hear, think, and talk about the new concept, and make connections to things you already know. The neuron axon fires and chemical signals are sent to the dendrites of other neurons.

You practice over and over, and pay attention to your mistakes. You think deeply about this new concept, focus on the parts that are hard for you, and don’t take any shortcuts. Dendrites grow like branches out of the neurons and reach out for other neurons.

You test yourself on the new concept and apply your knowledge to unique situations. You push yourself to see how much you can learn, and explain the concept to other people. The dendrites continue to grow more branches and the signals between them fire more quickly to other dendrites.

You find that some parts that once seemed hard are a little easier, but you continue to push yourself on to the next challenge and learn from your mistakes. With more practice, your dendrites continue to grow. The network of neurons becomes more efficient and powerful, making the brain denser and smarter than it was before.
The Power Of YET
“In a growth mindset, people believe that their most basic abilities can be developed through dedication and hard work—brains and talent are just the starting point.”

-Carol Dweck
The Power of "Yet"
The YET Continuum

- Not Comfortable
- Need Practice
- Got It
Starter Activity:

How comfortable are you with fostering growth mindset in your classroom?

Share your thoughts with your group, and place your hot dot on the continuum at your table.
The Growth Mindset Experiment at LHS

● We recognized the need on our campus for building academic confidence in math

● Research, by Dweck and others, tells us that mindset can be shifted
  **Our Brains Grow With Struggle!**

● We wanted to see if we could begin to positively affect our students’ mindsets in math
The Process:

● Asked for teachers volunteers (Math)
● Administered initial survey (September, 2014)
● Planned weekly activities
● Met monthly to discuss implementation, challenges, and next steps
● Administered follow-up survey (December, 2014)
What We Did:

- 5 minute lessons or activities
- 1 time/week
- In a classroom atmosphere where teachers were constantly mindful of the language that they were using and the messages that they were sending to students
Growth Mindset Group Survey Results

Growth Mindset

- Trying new things is stressful and I avoid it
- Some people are just good at math
- Nonacademic talents cannot be learned
- I can learn new things but it doesn’t change intelligence
- I do not see the benefit of working hard in a class
- As long as my answer is right work shouldn’t matter
- Truly smart people don’t need to work hard
- I appreciate feedback about my performance

Fixed Mindset

- Sept.
- Dec.
Control Group Survey Results

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Trying new things is stressful and I avoid it</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Some people are just good at math</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Nonacademic talents cannot be learned</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>I can learn new things but it doesn't change intelligence</td>
<td>3</td>
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<tr>
<td>I do not see the benefit of working hard in a class</td>
<td>4</td>
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<td>As long as my answer is right work shouldn't matter</td>
<td>3</td>
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<tr>
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<td>3</td>
<td>3</td>
</tr>
<tr>
<td>I appreciate feedback about my performance</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
Key Survey Items:

● “I can learn new things, but it doesn’t change intelligence.”

● “I do not see the benefit of working hard in a class.”

● “Some people are just good at math.”
Results of 3 Questions:

- Some people are just good at math
- I can learn new things but it doesn’t change intelligence
- I do not see the benefit of working hard in a class

Growth Mindset Group
Results Continued:

Control Group

- Some people are just good at math
- I can learn new things but it doesn’t change intelligence
- I do not see the benefit of working hard in a class

Teachers Working on Their Language
Giving Feedback To Kids

Really?
Dweck’s Message to Teachers and Parents:

“Teach your children to love challenges, be intrigued by mistakes, enjoy effort, and keep on learning. That way, our children don’t have to be slaves of praise. They will have a lifelong way to build and repair their own confidence.”

You’ve done really well, you must be so clever

All of you should be able to..., most will be able to...and some...
An Example of Student Language Change:

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**What Can I Say To Myself?**

*Instead of...*
- I’m not good at this.
- I’m awesome at this.
- I give up.
- This is too hard.
- I can’t make this any better.
- I just can’t do math.
- I made a mistake.
- She’s so smart. I will never be that smart.
- It’s good enough.
- Plan A didn’t work.

*Try thinking...*
- What am I missing?
- I’m on the right track.
- I’ll use some of the strategies we’ve learned.
- This may take some time and effort.
- I can always improve, so I’ll keep trying.
- I’m going to train my brain in Math.
- Mistakes help me to learn better.
- I’m going to figure out how she does it so I can try it!
- Is it really my best work?
- Good thing the alphabet has 25 more letters!

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https://twitter.com/sgray_NCSD/status/453720742757027841/photo/1
Instead of "Can't" Think:

I have some help.
I need some help.

Instead of Can't Think...

Nothing is IMPOSSIBLE!
The word itself is IMPOSSIBLE
I'm POSSIBLE
Math Is Hard

https://www.youtube.com/watch?v=Xs9aGVUZ3YA
Video Impact
“Do you know” List

1) Make a scatterplot.
2) Find an LSRL (create a model).
3) Calculate and interpret a residual by hand.
4) Make a residual plot/plot if a linear model is appropriate.
5) Interpret slope, y intercept, correlation coefficient of determination.
6) Get an LSRL from a computer output.
7) Get an equation from $\frac{y}{x}$ and $\bar{y}$.
8) Make a prediction with nonlinear data.
9) Do an inverse transformation.
10) Recognize bias.
11) Recognize types of sample designs.
12) Use a random digits table for an SRS.
13) Make a graph (dotplot, stemplot, histogram, boxplot) to display & interpret data.
14) Find outliers, recognize measures of central tendency.
15) Use graphs to compare 2 distributions.
16) Draw and use an ogive.
17) Recognize components of experiments.
18) Describe or design a valid experiment.
19) Find probability on a uniform curve.
20) Use the empirical rule.
21) Use $z$ scores to find probability on a normal curve.
22) Use probability rules & tables to find the likelihood of an event.
23) Find probability of continuous random variables.
24) Find mean & std. dev. of discrete random variables.
25) Combine random variables.
26) Find binomial probabilities.
27) Apply binomial & geometric probabilities.
To be outstanding - get comfortable with being uncomfortable.
Being Uncomfortable

https://www.youtube.com/watch?v=JC82Il2cjqA

Students watched the video and discussed it. Each student created a current “uncomfortable statement”, wrote down 2 specific ways to get more comfortable, and posted them in places where they would be seen during the next week(s).
Create a YET Continuum that fits your class!
Emily’s Homework Pic
How could you use the YET Continuum in your class?
Next Steps

- Mindset Mondays
- Whole School Staff Development
- Students Take Ownership
- Parent Education
“I am more convinced than ever that mindsets toward learning could matter more than anything else we teach.”

-Sal Khan
(The Khan Academy)
Moving Forward

https://www.youtube.com/watch?v=7p_eKV3SzW8

- Write down one idea to try that will move you forward on the continuum
- Put it in a prominent place as a reminder during the coming weeks
LINK to important information
Thanks for joining us today!

Please Keep Moving Forward!
NOT
COMFORTABLE
NEED
PRACTICE

GOT

IT
Growth Mindset Teacher Resources

MindSet Works

http://www.mindsetworks.com/free-resources/enjoy.aspx

Video: Carol Dweck on Struggle

https://www.teachingchannel.org/videos/embracing-struggle-exl

Teaching Strategies to Create Growth Mindset

http://www.sec-ed.co.uk/best-practice/teaching-strategies-to-create-growth-mindsets

Mindset Max

http://mindsetmax.com/blog/

Resources for Teaching Growth Mindset

http://www.google.com/images?hl=en&q=Resources+for+teaching+growth+mindset&gbv=2&sa=X&oi=image_result_group&ei=i7kHVMTTJYywggTzl4GAAQ&ved=0CDkQsAQ

The Perils and Promises of Praise by Carol Dweck w/ teacher speak examples

https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGvmbVXVsdGRvbWFpbnxkJW52ZZJmZWxsb3dyZXNvdXjizXN8Z3g6NmY4MjM4OTMzMDMjODRjOQ

Expeditionary Learning Protocols


Growth Mindset Videos

http://engagetheirminds.wordpress.com/2014/04/16/growth-mindset-videos/

Resilience and Grit: Resource Roundup

http://www.edutopia.org/resilience-grit-resources

Student Example of Growth Mindset Language

https://twitter.com/sgray_NCSD/status/453720742757027841/photo/1
Vennspired.com

http://venspired.com/6155-2/posters/

New study yields instructive results on how mindset affects learning


***LARRY FERLAZZO’S WEBSITES OF THE DAY…

http://larryferlazzo.edublogs.org/2012/10/13/the-bestresources-on-helping-our-students-develop-a-growth-mindset

The Growth Mindset: The Important Concept NOT Taught Under the Common Core

http://blog.mimio.com/the-growth-mindset

DEVELOPING A GROWTH MINDSET (AWESOME Mindset in math PPT!)


Growth Mindset Bulletin Boards


Instead of...Poster

http://venspired.com/6155-2/posters/
Weeks 5-8

Week 5:
Hand each student two post-it notes. On both notes, write an alternative thought for the word “can’t.”
(The same thought goes on both notes.) Post one post-it on the “Instead of “can’t,” think.. poster, and place the other somewhere where students can see it daily.

Week 6:
Ask your students to answer the following questions:
How do you study?
How do you use Pride Time?

Share this resource that lists the most effective ways to study for math:
Discuss

Week 7:
Watch this video:
https://www.youtube.com/watch?v=JC82Il2cjqA
Create a current “uncomfortable statement”, write down 2 specific ways to get more comfortable, and post it in a place that you will see it a lot during the next week.

Example: I am not comfortable with chain rule. I will be working on practice sheets and coming in for Pride Time/Den to get more comfortable.

Week 8:
Watch this video:
https://www.youtube.com/watch?v=Xs9aGVUZ3YA
If time permits, ask students what stuck out to them.
Growth Mindset Framing

In order to create a "risk-free" classroom environment where all students are willing to take on challenges and push themselves, it is important to make the focus on learning clear, make it safe to risk mistakes, and communicate a high confidence in all students’ ability to rise to the learning challenges. Use the following statements when introducing a new topic, concept, skill, or assignment in class:

For Communicating a Learning Goal

- New material is an opportunity to stretch!
- Today’s learning objective will give everyone an opportunity to stretch.
- Today, your brain will get stronger.
- I am hoping that you all do not know this already; I wouldn’t want to waste your time!
- I really want us to stretch beyond our comfort zone on this!
- After you do this, I’m going to ask everyone to share one mistake so we can learn from it.
- I’d like everyone to share one thing that is really confusing with their partner.
- The point of the lesson is learning; I want to know what parts are unclear so we can all meet our learning target.
- Today’s target for learning is ____. By tomorrow our goal is ____.
- I do not expect you to know this already. I am here to help you learn challenging material.
- Today, I want you to challenge yourself. Stretch to learn this challenging material.
- This is very dense reading/challenging material. I am not going to hold you accountable for understanding all of it right away, but I want you to give it a first try.
- This is just the first draft—you’ll have lots of chance to improve it.
- I want you to push yourselves to tackle this concept.
- You won’t be graded on this—it’s a risk-free zone!
- We’re in the learning zone today. Mistakes are our friends!

For Communicating High Expectations

- I know that you (all) have the ability to do this, so I have set the bar high.
- This will be a challenging concept to learn, but all of us can reach the goal.
- Be sure to communicate with me about your progress so I can provide support to you.
- I am going to push you all because I know if I do you will all do amazing work!
- Our classroom is a place for everyone to learn challenging material. I am here to help you meet that goal.
- This is challenging, but rewarding!
- This may be difficult right now, but you will remember it for the rest of your life.
- When you master this learning, you can be proud because this isn’t easy.
- Here is my challenge for you. I know you can meet it. I want you to challenge yourself.
- As you learn this, mistakes are expected. Your mistakes help me support you.
- Let’s make mistakes together!
- I have seen you stretch and succeed in the past. Let’s do it again.
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Mistakes Are Not All Created Equal

by Eduardo Briceno
CEO Mindset Works

A growth mindset about mistakes

We can deepen our own and our students' understanding of mistakes, which are not all created equal, and are not always desirable. After all, our ability to manage and learn from mistakes is not fixed. We can improve it.

Here are two quotes about mistakes that I like and use, but that can also lead to confusion if we don't further clarify what we mean:

"A life spent making mistakes is not only most honorable but more useful than a life spent doing nothing" - George Bernard Shaw

"It is well to cultivate a friendly feeling towards error, to treat it as a companion inseparable from our lives, as something having a purpose which it truly has." - Maria Montessori

These constructive quotes communicate that mistakes are desirable, which is a positive message and part of what we want students to learn. An appreciation of mistakes helps us overcome our fear of making them, enabling us to take risks. But we also want students to be able to understand what kinds of mistakes are most useful and how to learn from them.

Types of mistakes

The stretch mistakes
**Stretch mistakes** happen when we're working to expand our current abilities. We're not trying to make these mistakes in that we're not trying to do something incorrectly, but instead, we're trying to do something that is beyond what we already can do without help, so we're bound to make some errors.

Stretch mistakes are positive. If we never made stretch mistakes, it would mean that we never truly challenged ourselves to learn new knowledge or skills.

Sometimes when we're stuck making and repeating the same stretch mistake, the issue may be that we're mindlessly going through the motions, rather than truly focusing on improving our abilities. Other times the root cause may be that our approach to learning is ineffective and we should try a different strategy to learn that new skill. Or it may be that what we're trying is too far beyond what we already know, and we're not yet ready to master that level of challenge. It is not a problem to test our boundaries and rate of growth, exploring how far and quickly we can progress. But if we feel stuck, one thing we can do is adjust the task, decreasing the level of challenge but still keeping it beyond what we already know. Our *zone of proximal development (ZPD)* is the zone slightly beyond what we already can do without help, which is a fruitful level of challenge for learning.

We want to make stretch mistakes! We want to do so not by trying to do things incorrectly, but by trying to do things that are challenging. When we make stretch mistakes we want to reflect, identify what we can learn, and then adjust our approach to practice, until we master the new level of ability. Then we want to identify a new area of challenge and continue stretching ourselves.

**The aha-moment mistakes**

Another positive type of mistake, but one that is harder to strive or plan for, is the *aha-moment mistake*. This happens when we achieve what we intend to do, but then realize that it was a mistake to do so because of some knowledge we
lacked which is now becoming apparent. There are lots of examples of this, such as:

- **When we lack the content knowledge**: e.g. not finding water, we try to extinguish a fire with alcohol, which we didn't realize is flammable.

- **When we find there is more nuance than we realized**: e.g. in our painting, we color a sun near the horizon as yellow, and later notice that the sun does not always look yellow.

- **When we make incorrect assumptions**: e.g. we try to help someone else, thinking that help is always welcome, but we find out that the person did not want help at that moment.

- **When we make systematic mistakes**: e.g. a fellow educator observes us doing a lesson and later points out, with compelling back-up data, that we tend to call on Caucasian girls much more often than we do other students.

- **When we misremember**: e.g. we call a friend for their birthday on the right date, but the wrong month.

We can gain more aha moments from mistakes by being reflective. We can ask ourselves *What was unexpected? Why did that result occur? What went well and what didn't? Is there anything I could try differently next time?* We can also ask people around us for information we may not be aware of, or for ideas for improvement.

**The sloppy mistakes**

*Sloppy mistakes* happen when we're doing something we already know how to do, but we do it incorrectly because we lose concentration. We all make sloppy mistakes occasionally because we're human. However, when we make too many of these mistakes, especially on a task that we intend to focus on at the time, it signals an opportunity to enhance our focus, processes, environment, or habits.

Sometimes sloppy mistakes can be turned into aha moments. If we make a mistake...
because we're not focused on the task at hand, or we're too tired, or something distracted us, upon reflection we can gain aha-moments on how to improve, such as realizing we're better at certain tasks after a good night's sleep, or that if we silence our gadgets or close our doors we can focus better.

**The high-stakes mistakes**

Sometimes we don't want to make a mistake because it would be catastrophic. For example, in potentially dangerous situations we want to be safe. A big mistake from the person in charge of security in a nuclear power plant could lead to a nuclear disaster. We don't want a school bus driver to take a risk going too fast making a turn, or a student in that bus to blindfold the bus driver. In those cases, we want to put processes in place to minimize *high-stakes mistakes*. We also want to be clear with students about why we don't want the risk-taking behavior and experimentation in these situations, and how they're different from learning-oriented tasks.

Aside from life-threatening situations, we can sometimes consider performance situations to be high-stakes. For example, if going to a prestigious college is important to someone, taking the SAT could be a high-stakes event because the performance in that assessment has important ramifications. Or if a sports team has trained for years, working very hard to maximize growth, a championship final can be considered a high-stakes event. It is okay to see these events as performance events rather than as learning events, and to seek to minimize mistakes and maximize performance in these events. We're putting our best foot forward, trying to perform as best as we can. How we do in these events gives us information about how effective we have become through our hard work and effort. Of course, it is also ok to embed learning activities in high-stakes events that don't involve safety concerns. We can try something that is beyond what we already know and see how it works, as long as we realize that it may impact our performance (positively or negatively). And of course, we can always learn from these performance events by afterwards reflecting and discussing how things went, what we could do differently next time, and how we could adjust our practice.

In a high-stakes event, if we don't achieve our goal of a high test score or winning the championship, let's reflect on the progress we've made through time, on the approaches that have and haven't helped us grow, and on what we can do to grow more effectively. Then let's go back to spending most of our time practicing, challenging ourselves, and seeking stretch mistakes and learning from those mistakes. On the other hand, if we achieve our target score or win a championship, that's great. Let's celebrate the achievement and how much progress we've made. Then let's ask ourselves the same questions. Let's go back to spending most of our time practicing, challenging ourselves, and growing our abilities.

We're all fortunate to be able to enjoy growth and learning throughout life, no matter what our current level of ability is. Nobody can ever take that source of fulfillment away from
Let's be clear

Mistakes are not all created equal, and they are not always desirable. In addition, learning from mistakes is not automatic. In order to learn from them we need to reflect on our errors and extract lessons from them.

If we're more precise in our own understanding of mistakes and in our communication with students, it will increase their understanding, buy-in, and efficacy as learners.

About Mindset Works

Mindset Works was co-founded by one of the world's leading researchers in the field of motivation, Stanford University professor Carol S. Dweck, Ph.D. and K-12 mindset expert Lisa S. Blackwell, Ph.D. The Company translates psychological research into practical products and services to help students and educators increase their motivation and achievement.

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I had never truly reflected on the notion that "learning from mistakes is not automatic. In order to learn from them we need to reflect on our errors and extract lessons from them," but after reading, it makes sense. Taking the time to discuss mistakes and encourage students to both reflect on and correct them is crucial in order for learning to take place.
ed briceno Thursday, 22 January 2015

Thanks, Perini, for sharing your reflection. Once you more deliberately explore mistakes with your students, we’d love to learn more about their reactions and your further reflections, if you get a chance. Happy learning!

arati Wednesday, 28 January 2015

amazing!

Geraldine Norman Wednesday, 28 January 2015

A really clear exposition of the importance of being careful of generalisations about learning. Thank you

Alison Bramall Wednesday, 28 January 2015

What an excellent article. I can put it to good use in training mentors

Diane DeStefano Wednesday, 28 January 2015

I've had to learn to accept and learn from stretch mistakes. I was born in an era when making mistakes was seen as a negative/punishable thing. Therefore, I've always tried to do things without flubs. As a martial artist, I had an easy time learning lower forms and usually needed to be shown only once. With the higher forms that I am now learning, I often need multiple demonstrations or even having the form broken into smaller bits. I've learned to appreciate facing the challenge of harder combinations. A-ha moments come when I've been doing something blindly and suddenly realize the purpose/application for...
the movement. After teaching for so long, the challenge for me is to apply my martial arts learner experiences to my job as a teacher/learner. Sometimes it feels like I'm starting over from scratch. That's ok though; I am starting developing a new mindset and that makes old things new again!
YOU HAVE ONLY FAILED IF YOU HAVE GIVEN UP

Until then, it's learning
HAVH DOA _-u
CIEI'llIVd
To be outstanding -
get comfortable
with being
uncomfortable.

Alrik Koudenburg
Being Constantly Worried about getting it Wrong Prevents Us from Getting it Right.

...Let Go n Let it Flow...
DON'T PRACTICE UNTIL YOU GET IT RIGHT. PRACTICE UNTIL YOU CAN'T GET IT WRONG.

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**Weeks 1-4: Growth Mindset Curriculum for Students:**

- **WEEK 1 (9/23-9/26):**
  Show the video clips.
  
  [https://www.youtube.com/watch?v=pN34FNbOKXc](https://www.youtube.com/watch?v=pN34FNbOKXc)
  
  *Segment 1 beginning to 2:55
  
  *Segment 2 begins at 9:40 and ends at 10:33
  
  Discuss the video and its connection to your classroom.

- **WEEK 2 (9/29 - 10/3):**
  Recap video and ask students to write one specific thing that they’re not comfortable with in math. Add the word YET at the end of each statement. Turn in to teacher.

  OPTION: Ask students to write their names on a separate sheet of paper and post along the continuum on the wall.

- **WEEKS 3 and 4 (10/6 - 10/17):**
  
  [https://twitter.com/sgray_NCSD/status/453720742757027841/photo/1](https://twitter.com/sgray_NCSD/status/453720742757027841/photo/1)
  Show example and have students create a “What I can say to myself” poster
  
  Process: Using a post-it students each create a negative statement that they might typically use in math and on another post-it create an alternative statement that supports growth mindset. Gather on one piece of butcher paper and hang.
**Weeks 9-12**

**Dec. 1-5**  
Show the following video clip

https://www.youtube.com/watch?v=7p_eKV3SzwE

Ask students to complete the following sentence on a strip of paper  
I wouldn't have ____________________ if I had given up.

Use a personal response for an example. Post responses around the room.

**Dec. 8-12**  
Give out Persistence and Grit awards: We’ll have these for you to fill in.  
Recognize as many students as you can!  
Give names of potential student presenters for February Conference.

**Dec. 10-15**  
Give the second survey