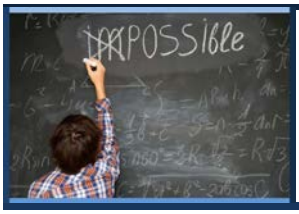

Having a Growth Mindset: Using Facts from Brain Science to Change Your Life

This lesson acquaints students with brain research showing that: a) the different regions of our brain gain expertise when we "exercise" those regions and, b) we can learn anything, through persistent and strategic effort.

Essential Question

How can I develop the expertise and mindsets I need to accomplish my most important goals despite the challenges I face along the way?

Guiding Questions

What do recent scientific findings about the brain teach us about our ability to increase our learning power?
How do you exercise your brain and make it gain expertise?

Objectives

- Students will learn that persistent efforts and experiences help parts of the brain grow stronger and gain expertise
- Students will watch and rate two videos about the brain and how humans learn.
- Students will learn about real life experiences that show how effort and persistence increase expertise.

Advance Preparation

- Post the vocabulary words on the Word Wall.
- Load all videos.
- Place handouts for students to pick up on arrival.

Materials/Resources

- PowerPoint slideshow 2.6 (adapt as needed)

Student Materials

- "My Video Reviews" activity sheet

Vocabulary	• Expertise • Hippocampus (*pl.* hippocampi) • Growth mindset • Gray matter • Neuroplasticity

Do Now 3 min.

Slide 1: Students discuss in pairs how to help Allie remember to turn in her homework.

Introduction (Framing/Overview) 2 min.

1. Slide 2: Student Dedication (30-60 seconds)
2. Slide 3: Tell students, "When you know the truths revealed by brain research, it will set you free to have a growth mindset that can change your life."
3. Show slide 4 and review agenda with students, telling them that today
   - We will learn good news about the brain, and about ourselves.
   - We will watch four videos and discover
     - how **London Taxi Drivers** exercise their brains to become better navigators
     - what neuroplasticity is, and how it enables us to create new possibilities within our brains
     - why it is possible to learn almost anything with persistent effort
     - and how **John Legend** used a growth mindset as his ticket to become a recording star.
   - Students will review two of the videos (neuroplasticity and "You Can Learn Anything").

Activity 1: Exercising the Brain 10 min.

1. (Note: Slide 5 opens with question; click through to the answer and then to the photo of Ashton Eaton, the muscular two-time Olympic Champion in the decathlon.) Tell students:

   "One of the most important things scientists have learned about the brain [click] is the good news that different parts of the brain are sort of like muscles [click] – they grow stronger (and gain expertise) as you exercise them."

Direct Instruction

2. Point out to students that each of them has years of experience exercising the brain. Invite them (slide 6) to take 90 seconds to think of something they've learned to do that **many people** don't know how to do. Then, they should ask themselves, "How did I exercise my brain?" "How did I make it become great at doing that thing well?" After the 90 seconds is up, each person will pair with a partner to share what their special skill is and how they learned to do it well.

   Think - Pair – Share

   After the **90 seconds of think time** is up, click through to have students share their experience with a partner. After four minutes, click through and call on random pairs to share their ideas with the class about ways to exercise the brain and grow its expertise (slide 7).

   Whole Class Discussion

   Wrap up the activity by clicking through the 4-part summary on slide 7 of key answers to the question, connecting those answers to similar ideas students have mentioned.

   Direct Instruction

Activity 2: Taxi Drivers and Their Brains 10 Min.

3. (Slide 8) Tell students, "Each year millions of travelers, tourists, and commuters rely on taxi drivers in London, England, to get around the city. The drivers are famous for knowing the best and fastest route to get anywhere in the city. But, how do they gain the expertise to be able to choose the best route to each passenger's destination, without looking at a map or relying on a navigation system?

   Direct Instruction

   "To become a taxi driver in London, you have to pass a very difficult licensing exam showing that you are ready for the job. Let's watch a video about how aspiring taxi drivers prepare for that exam." [click the link to the video on the slide]

   Media Interaction

4. Show slide 9, "Meet the Hippocampus." Explain to students that these images highlight a part of the brain—the hippocampus—that taxi drivers exercise a lot. Point out to students the front view of the brain (*right hand image*), showing the two of them, one on each side of your **brain**, shown in red in the drawing. The left-hand image shows a side view of one hippocampus. Explain to students that the **hippocampus** is located behind a person's eyes. One part of each hippocampus is important for *spatial memory* and *navigation*. Other areas of the hippocampus coordinate and control our emotions, other types of memory, and body functions such as breathing, heartbeat, and digestion.

   Direct Instruction

5. Ask students how they think the brains of taxi drivers might compare to those of other people (slide 10). Ask students why they think taxi drivers might exercise the navigation part of their hippocampus a lot more than do other people. (Of course, they constantly update their navigation skills and mental maps by taking new routes, traveling to different locations, and figuring out the best ways to get to new attraction.) Tell students, "This is why Dr. Eleanor Maguire, a brain science specialist at a London university, suspected that these taxi drivers would develop significantly more gray matter—working brain tissue—in that part of the hippocampus than other people have. So Professor Maguire decided to test her hypothesis."

Whole Class Discussion

Direct Instruction

6. Ask if any students have ever had an MRI, or know what an MRI is. Explain, "An MRI is a little like a 3-D X-ray. Technicians use a special machine to take many photos inside a part of your body and then combine these photos to create a 2- and 3-dimensional image of it. Professor Maguire took MRI photos of the brains of 16 taxi drivers and 50 non-taxi drivers (show slide 11). Then she used the photos to measure the amount of gray matter in each part of the brain for each person. Taxi drivers had just the same amount of gray matter as other people in most parts of the brain. But, just as Professor Maguire had predicted, in the navigation part of the hippocampus, taxi drivers had grown much more gray matter than other people." Explain that the slide shows two photos from Professor Maguire's study. They are close-ups of the navigation centers (highlighted in greenish yellow) in the left hippocampus and right hippocampus of one of the taxi-drivers. On average, these centers are 4 times larger in taxi drivers than in non-taxi-drivers. As this example shows, our brains actually change when we exercise them regularly to grow our knowledge and expertise.
7. Explain to students that healthy brains never stop learning and gaining new expertise… IF we keep giving them new challenges to solve and new experiences from which to learn. **Slide 12** shows how on average, gray matter continues to increase in the navigation centers of taxi drivers' brains each year that they are on the job. A taxi driver who has been driving passengers around for 8 years has about twice as much gray matter in the brain's GPS than one who has only been on the job for 4 years. Those who have been working for more than 25 years have about 5 times as much as those drivers who with 4 years' experience. Even people who are experts at their job

still find many new things to learn and continue to develop new skills and knowledge.

8. Explain to students that eagerness to learn new things and keep trying even when it's hard is called having a **growth mindset**—assuming that your brain can grow and learn new things, rather than thinking you are limited to what you already know and do.

Activity 3: Two Videos about the Brain 10 Min.

Whole Class Discussion

- Ask students, "Suppose you're bored and you decide to watch a movie. You look at a listing and see the title of a movie you've never seen before. How would you make a decision about whether that movie is worth watching or not?" Let several students share their approaches, then ask how many students are familiar with the "Rotten Tomatoes" website. If some students are not familiar with the site, explain (or allow a student volunteer to explain) that movie critics on the site describe movies either as "Fresh" (positive) or "Rotten" (negative). Ask students, "If 76% of the critics gave a movie a review as 'Fresh,' would you watch it or not?"
- Tell students that today, it is **their turn** to be video critics (slide 13). They will watch two very short videos related to today's lesson and rate each one on several points, including whether they think the video is "fresh" or "rotten." Their rating will help the authors of this lesson decide whether or not to use these videos in the second edition of this curriculum. Call students' attention to the rating sheet "My Video Reviews." They are to rate each video on the questions asked and turn in their review sheet at the end of class.

Media Interaction

- Tell students that the first video is about neuroplasticity, the brain's ability to develop through experience and effort. As we saw in the case of the London taxi drivers, this can be very useful—but how does it work, exactly? (Play the video and then give students time to rate it.)
- Show the second video, "You Can Learn Anything" and give students a few moments to rate it, using the lower half of the review sheet.

Closure: John Legend's Road to Success 5 min.

- Tell students (slide 14) that you will spend the last few minutes of class learning from John Legend, a famous singer and songwriter, how having a growth

mindset—persisting despite failure and discouragement—led to his success. (Play the video; if you have time, let several students share their reactions.)

- Exit ticket: Make sure students turn in their video reviews before leaving the class.

Extensions

If you have extra time, after each of the brain science videos, invite students to briefly share their thoughts and reactions.

If you wish to assign homework, ask students to think about the career choice they made in Unit 1. Have them use their journals to record their ideas about which parts of the brain people in that profession might develop to a greater extent than most other people do.

Video links:

https://www.youtube.com/watch?v=sU4W36_5oiM

https://www.katrinadreamertutoring.com/The Importance of Growth Mindset and Neuroplasticity.html

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

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

My Video Reviews

Tell the authors what you think by circling your response to each question:

Video #1—*Neuroplasticity:*

1. How important was the information in this video?

Not at all important Somewhat important Very important

2. How boring was the video?

Very boring Somewhat boring Not boring

3. How confident are you that the video will encourage viewers to not give up when they confront challenges?

Not confident Somewhat confident Very confident

4. Overall, would you rate the video as rotten or fresh?


Rotten


Fresh

Video #2—*"You Can Learn Anything":*

1. How important was the information in this video?

Not at all important Somewhat important Very important

2. How boring was the video?

Very boring Somewhat boring Not boring

3. How confident are you that the video will encourage viewers to not give up when they confront challenges?

Not confident Somewhat confident Very confident

4. Overall, would you rate the video as rotten or fresh?


Rotten


Fresh