GO!

PART III. LESSONS & MATERIAL GUIDE FOR TEACHERS

UNIT 2: BRAIN BEHAVIOR

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GET READY!

Unit Goal

Students learn that the brain functions by sending chemical messages through a network of nerve cells, and that these cells are responsible for thought. This insight provides a foundation for understanding how learning changes the brain—the growth mindset. They also learn that emotions influence the brain, and are taught strategies for managing their negative emotions and enhancing the positive ones.

Key Challenge

Students whose learning and performance are hampered by test anxiety and other negative emotions can learn to manage their anxiety with a little knowledge about how the brain works.

Suggested Teacher Reading


Unit 2 Takeaways:

- The brain is made up of nerve cells, called neurons, in a network of over 1 trillion connections.
- Neurons communicate with each other through these connections, using chemicals called neurotransmitters.
- The branching parts, called dendrites, receive messages, and the long part, called the axon, transmits a signal through the neuron.
- Thinking is influenced by the emotions, especially anxiety.
- When facing any type of threat, the brain sets off a fight-or-flight response—physical symptoms of anxiety that can interfere with thinking.
- Many students have performance anxiety—stress related to taking tests, giving presentations, or other performance-oriented situations—that can interfere with performance even when they know the material.
- A student can lower anxiety by being prepared, thinking positively, and calming breathing.
For the teacher: What makes students want to learn?

When students are focused on learning as a goal, they are more likely to stick with difficult things, to seek help when they need it, and to work hard. However, because many students are worried about performing poorly in the very areas where they most need to learn, they may be too afraid of “looking dumb” to risk trying to learn. Anxiety is often a product of a fixed mindset, in which every performance is high-stakes. We can help to focus students on a learning goal by letting them know that learning usually involves making mistakes, showing one’s lack of skill and not doing as well as others who are more expert. Students often feel that only top students are successful and admired by teachers. By focusing on students’ growth and progress, rather than on their performance relative to others, we can decrease their fear of “looking dumb.”

Remind students that everyone blunders when they are learning something. Let your students know that mistakes are not only okay; they can be useful feedback in the learning process. Praise students for their effort and progress, and don’t overemphasize perfect performance.

Unit 2: GET SET! Building, Reinforcing and Maintaining the Growth Mindset

Providing Student Feedback:

In class, encourage students to use new strategies and stay persistent despite difficulties by praising their process, rather than their ability. Taking on challenges is the only way to learn, and making mistakes is an important part of learning. Reminding students that learning a new skill is usually difficult at first will help them persist until they achieve mastery. Knowing that other people struggle as well helps students overcome their frustration with difficult new applications.

For example,

- If you could already do it perfectly, you wouldn’t be learning anything.
- I don’t know anyone who hasn’t struggled with this kind of problem, until they learn how to do it.
- By working on this, you can build your skills in this subject.
- You can use this mistake. Think about why it didn’t work, and learn from it.
- Don’t worry about getting it wrong—I just want you to understand how to do it.
- You know, if you learn how to do this type of problem it will really help you with ________ (describe how a new skill might be applicable in a student’s life; for example, understanding percentages and fractions will help you to keep track of sports statistics).
- Remember the feeling you felt when you accomplished something hard after a lot of effort. Strive to achieve that feeling again.
Concrete Strategies:

Students often have performance anxiety, particularly when it comes to test-taking, giving presentations, or discussing their questions and problems with the class. This anxiety can interfere with learning and performance much more often than we may recognize. To deal with anxiety about performance, address stress in class directly to show that it is perfectly normal to feel anxious when being tested or performing new skills. Suggest that your students try the following strategies to manage anxiety:

- Change thoughts and preconceptions about test taking from negative to positive—instead of saying, “I’m going to fail,” say, “I’m going to do my best.” Focus on the goal you want to achieve, not the risk of failure. Set positive and realistic goals.

- Focus on the PROCESS, not the OUTCOME. A learning or test-taking strategy (process) that includes studying as well as ways to relax before and during the test, if students begin to panic, will ultimately yield a better test score (outcome) than placing emphasis on the score alone.

- Square breathing can really help students if they start to panic during a test, or at any other time they feel overcome with anxiety. You accomplish it by breathing in slowly to a count of 5; holding for 5; breathing out slowly to a count of 5; and holding for 5. This ensures that you neither hyperventilate nor hold your breath in times of stress. Use a moment of square breathing to relax your mind during a test—taking time out can help you finish what you need to do and feel good about it, too.

Sample Outline of Sessions- Unit 2

<table>
<thead>
<tr>
<th>Session</th>
<th>Activity</th>
<th>Pages</th>
<th>Approx. Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>“Connect It” Discussion: Overcoming Challenges</td>
<td>7</td>
<td>15-30 min.</td>
</tr>
<tr>
<td></td>
<td>Brainology® Online Unit 2</td>
<td>N/A</td>
<td>30-35 min.</td>
</tr>
<tr>
<td>Bridge*</td>
<td>“Reinforce It” Activity: Stress Inventory</td>
<td>10-11</td>
<td>10-20 min.</td>
</tr>
<tr>
<td>2</td>
<td>“Apply It” Case Study: Alicia</td>
<td>12-13</td>
<td>15-45 min.</td>
</tr>
<tr>
<td></td>
<td>Supplemental Activity: “Pipe Cleaner Neurons”</td>
<td>17-19</td>
<td>20-30 min.</td>
</tr>
<tr>
<td>Bridge*</td>
<td>“Check It” Quiz</td>
<td>14-15</td>
<td>10-20 min.</td>
</tr>
<tr>
<td>Optional**</td>
<td>Supplemental Activities: “Vocabulary Builder” OR “Actively Seeking Information”</td>
<td>23 20-22</td>
<td>10 min. 30 min.</td>
</tr>
</tbody>
</table>

* Bridge activities can be used as exit activities at the end of class, as homework between classes, or as “Do Now” activities at the beginning of the next class.

** Optional activities can be used as additional activities for students who complete other assignments more quickly, as alternative assignments for differentiation, or to make up an extra session focused on this unit of Brainology.
Unit 2: GO!
Printable Activities and Materials
Unit 2 “Connect It” – Discussion/Reflection: Overcoming Challenges

Description: Brainology Program Unit 2 Anticipatory Activity

Objective: Students will make connections between their own experience and the content of Brainology Level 2: Brain Behavior.

Timeline: approximately 15-30 minutes

Instructions:

- Explain to students that the focus today will be overcoming challenges; they will be learning more information about how the brain works, and how emotion plays a role in thinking.
- Introduce the discussion topic:
- Many famous and successful people did not seem headed for greatness in their early lives. Michael Jordan, one of the greatest basketball players of all time, did not make his high school team. Helen Keller, who overcame both blindness and deafness to become a famous writer, was mistaken as mentally disabled early in life. And one of the most respected scientists in history, Albert Einstein, failed classes in grammar school. Yet they all went on to achieve great things in their fields of expertise and in their lives. People may face prejudice—low expectations and negative judgments by others based on their identity—such as “Girls can’t do math.” Women such as Mae Jemison, the first African American woman in space, faced such prejudice.
- What obstacles do you think these people experienced in their early lives? Do you think others may have told them they couldn’t succeed? Do you think they sometimes doubted themselves?
- What do you think they did to overcome these challenges and achieve their goals?
- Is there a high-pressure situation in your own life where you also overcame a challenge? In this situation, what did you do to achieve your goals?
**Unit 2 ” Practice It”: Think, Pair, Share**

**Description:** Brainology Program Unit 2 Active Review

**Objective:** Students will develop their understanding of the material through active listening and speaking.

**Timeline:** approximately 20 minutes

**Instructions:**

- Place students in partners (knee-to-knee), and give each student one square.
- Tell them to name one partner A and one partner B (you may select who is who if students are knee to knee by saying that those who are “facing the clock” are ‘A’).
- Then ask one partner (A) to ask the other (B) the first question. Use random response to ask partner A to repeat what partner B said.
- Repeat for all questions, rotating roles according to the card.
- Encourage students to keep these cards in their binders to do a Brain Scan periodically.
**Brainology® Unit 2 Brain Behavior: “Practice It”**

*Photocopy and Cut so each student has his/her own card.*

Unit 2 Reinforce It
Give Yourself a Brain Scan!

Remember, you need to try to give your brain everything it needs to learn well. Use this check list to make sure you are giving your brain all the help it needs:

Think of ANY difficult thing you tried recently…

- Did you use positive thinking today instead of negative thoughts?
- If you felt nervous about something, did you use square breathing to calm yourself down?
- Did you approach a new task by breaking it into smaller parts?
- Did you focus on strategies to succeed?
- Did you give yourself enough time to do the task?

Unit 2 Reinforce It
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- Did you focus on strategies to succeed?
- Did you give yourself enough time to do the task?
Unit 2 “Reinforce It”: Personal Stress Symptoms Inventory

Description: Brainology Program Unit 2 Practice Activity

Objective: Students will increase self-awareness and coping skills by recognizing their own personal stress symptoms and how they affect learning.

Timeline: approximately 10-20 minutes

Instructions:

• Allow students to complete Stress Symptom Inventory
• Discuss with students the strategies that they can use in order to manage stress and improve their learning.
• Periodically redistribute this inventory so that students can compare their habits over the course of the program
PERSONAL STRESS SYMPTOM INVENTORY
“Fight or Flight”

First, circle the top 5 symptoms that would significantly affect a student’s performance in school.

Then put a star next to the top 5 symptoms that YOU experience when you feel stress.

Feel restless/ start fidgeting  Feel sad/depressed  Grind teeth
Feel exhausted/tired       Begin crying            Heart beats faster
Begin sweating             Boredom                Heartburn
Sleep or go to bed to escape    Aggression      Muscles tighten up
Withdraw from people       Unable to concentrate     Cramps
Increase caffeine use       Sleeplessness, insomnia  Diarrhea
Stomach gets upset          Feel sick             Tap fingers/ feet
Headache                     Feel dizzy           Lose appetite
Face feels hot, flushed      Mouth/ throat gets dry  Bite nails

Which symptoms are both circled and starred?

Think of the strategies that you learned in Level 2 that you can try when you feel nervous and finish the quote below:

Next time I feel stressed, I will..............
**Unit 2 “Apply It”: Alicia**

- **Description**: Brainology Program Unit 2 - Application of new knowledge

- **Objective**: Students will deepen their understanding of the concepts learned in Unit 2 by applying this knowledge to a new situation.

- **Timeline**: 15 - 45 minutes (depending on development of scenario)

- **Instructions**:
  - Present Alicia’s situation
  - Ask students to use what they have learned in Brainology to help Alicia solve her problem. They can display their solutions in any of the following ways:
    - Role Play
    - Written response
    - Plan of Action
    - Discussion
    - Create a cartoon strip
    - Create a movie
Alicia

Alicia has to give an oral presentation about her research on endangered animals. This is a topic she is very interested in and she has researched it thoroughly.

The last time Alicia gave her presentation, though, she was also very interested in the topic and thought she was well prepared. To her surprise, when she stood in front of the classroom, she froze!

Alicia couldn’t understand why, as soon as she stood in front of the class, she couldn’t remember a thing! She thought she did everything she could to prepare—she read all about endangered animals, took notes, made drawings, watched videos, and even put her notes on index cards. What could have happened?

Alicia does not want the same thing to happen this time when she stands in front of the class. She knows her information really well and is prepared to tell the facts. She took notes, made drawings, and created index cards, just like she did the first time.

But what can she do to make sure she doesn’t freeze up again?

Congratulations!
You have successfully completed Level 2 of Brainology and you are now an Artisan. Dr. Cerebrus has taught you well. You know about brain behavior and you are now qualified to give advice.
Your new knowledge is ready to be applied.
Alicia needs your help!
Unit 2 “Check It”: [Teacher’s KEY]

Brainology® Check It– Unit 2 - Brain Behavior

(1) What is a neuron and what does it do?
Neurons are nerve cells that make up the gray matter of the brain. Billions of these cells are connected in a complicated, web-like network, which allows them to transmit information around your brain and throughout your body.

(2) What is happening in your brain when you think?
An electrical pulse goes down the axon of the neuron, and when it reaches the end, it makes the neuron release chemicals into the synapse—the space between it and the next neuron. These chemicals are messenger chemicals. They travel through the space between the neurons, and when they reach the other cell they fit into it like tiny keys in a lock, turning on the message. Most thoughts are the result of hundreds or thousands of neurons firing at once.

(3) When you feel anxious or afraid, what is happening in your brain?
Your brain is triggering a fight-or-flight response. This causes your body to release chemicals into your bloodstream that make your heart beat faster, your skin sweat, and your breathing speed up.

(4) What are 3 things that the Brainology® program told you to do in order to help yourself calm down when you are feeling nervous about a test?

- **Replace negative thoughts with positive ones.**
  Think about stress-inducing situations in a different way. Write down all the thoughts that worry you, and then write down more positive thoughts to replace each of them. Whenever you have a negative thought, practice saying the positive though instead. Replace, “What if I fail?” with “I’m going to try my best.”

- **Develop a strategy that will help you accomplish your goal and focus on executing your strategy.**
  Focus your mind on what you need to do, not on the outcome. Think about what strategy you will use, instead of what might go wrong. Developing and executing a strategy will decrease your anxious feelings and allow you to concentrate.

- **Use a breathing technique to physically calm yourself.**
  You can also do “square breathing” to help calm your body. Breathe in slowly, counting slowly one to five. Hold your breath for five more counts. Then, slowly breathe out to the count of five. Wait a count of five before you breathe in again. Repeat this process about ten times and it should help calm you down.
Brainology® Unit 2 Brain Behavior: “Check It”

Check It!

Label the parts of the neuron:

Explain, draw or represent what happens to the neurons in your brain when thinking is taking place.

Explain, draw or represent the brain’s “fight or flight response.”

Describe or represent 3 things the Brainology® program said that you can do to help yourself feel calm when you feel nervous before taking a test.
Unit 2: Supplemental Activities and Materials
Description: Pipe Cleaner Neuron Building Lesson

Timeline: 20-30 minutes

Instructions:

- Distribute the Neuron diagram, 3 long pipe cleaners, and 8-12 shorter pieces to each student.
- Ask students to participate with you as you model how to build a neuron.
- Take one pipe cleaner and roll it into a ball. This is the cell body.
- Take another pipe cleaner and attach it to the cell body by pushing it through the ball so there are two halves sticking out. Take the two halves and twist them together into a single extension. This will be the axon.
- Take other smaller pieces of pipe cleaners and push them through the cell body on the side opposite the axon. These are dendrites. You can twist more pipe cleaners to make more dendrites.
- Wrap one individual pipe cleaner along the length of the axon. This is the myelin sheath (If you have white or silver pipe cleaners this is a good color for it).
- Wrap another small piece of pipe cleaner on the end of the axon. This will be the synaptic terminal.
- Put students in groups of 5-7.
- Ask students to stand in a circle, holding their neurons in the middle of the circle (neurons should be lightly touching).
- Remind students that this is how millions of neurons in our brains are connected. The stronger the neurons are, the faster they work. The more dendrites that neurons grow, the more effective they are in helping us to think, move, perform, etc.
- Ask the class, what if some of the neurons were very weak? What would be the result? How would a person strengthen weak neurons? (For example, eating brain foods: getting enough sleep; lots of practice/study/exercise).
- Hang the neurons around the classroom as a reminder for students to work constantly at building their neural network.
- You may wish to keep materials in the classroom so that students can add to the neural network when they accomplish a difficult task or challenge.
The Neuron

dendrites

cell body and nucleus

myelin sheath

axon

synaptic terminal and buttons

Neurons in the cerebral cortex
Building a Network of Neurons

1. Take one pipe cleaner and roll it into a ball. This will be the cell body.

2. Take another pipe cleaner and attach it to the new “cell body” by pushing it through the ball so there are two halves sticking out. Take the two halves and twist them together into a single extension. This will be the axon.

3. Take other smaller pieces of pipe cleaners and push them through the “cell body” on the side opposite the axon. These are dendrites. These can be shorter than your axon and you can twist more pipe cleaners to make more dendrites.

4. Wrap small individual pipe cleaners along the length of the axon. These will represent the myelin sheath.

5. Wrap another small piece of pipe cleaner on the end of the axon. This will be the synaptic terminal.

Neuron Building Reflection:

As I was building my neuron, I was reminded of...
**Actively Seeking Information**

**Objective:** Students will use existing knowledge to create similes or metaphors in order to make personal connections to new vocabulary.

**Timeline:** approximately 30 minutes

**Instructions:**
- Show the class the picture of the labeled neuron (and a model if you have one or have built one from found materials). Use choral response to safely practice the pronunciation.
- Discuss/Review each part of the neuron and its function.
- Explain to the class that the strategy of creating similes and metaphors help our brains to learn something new by attaching the new concept to something that is familiar.
- Allow students to create their own metaphors or similes.
- Share/Post in classroom. Use as examples and reference as a sound study strategy.
Brainology® Unit 2 Brain Behavior: “Actively Seeking Information”

Name ____________________________________

<table>
<thead>
<tr>
<th>Vocabulary Word</th>
<th>Function</th>
<th>Simile or Metaphor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neuron</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dendrite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Axon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synaptic terminal/buttons</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Teacher’s Key

<table>
<thead>
<tr>
<th>Vocabulary Word</th>
<th>Our definitions and notes</th>
<th>Simile or Metaphor (you may write your own!)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brain</strong></td>
<td>The grey matter in your head that helps you think, feel, and plan</td>
<td>It’s like a computer CPU (Central Processing Unit) PLUS the hard drive. The CPU processes instructions; the hard drive is the memory.</td>
</tr>
<tr>
<td><strong>Neuron</strong></td>
<td>We have 100 billion of these. We can grow new ones and strengthen existing ones with learning and healthy habits. The amount of effort we put into learning determines how many neuron connections we will create in our brain. Everyone can get smarter.</td>
<td>A neuron is like a muscle in the body. If I exercise, I can make my muscles expand and grow. The amount of effort I put into working out determines how much stronger my muscles will grow. Everyone can get stronger.</td>
</tr>
<tr>
<td><strong>Dendrite</strong></td>
<td>We have over 100 trillion of these. This is what grows on the ends of neurons (like hairs) they connect to other neurons to grab information and send it through the brain. A “smart” person has a dense brain because they have grown so many dendrites.</td>
<td>A dendrite is like a shortcut from one place to another. It is like sending a text message or an IM. Your message is quickly sent and connects to the person (or people) to whom you are sending the message.</td>
</tr>
<tr>
<td><strong>Axon</strong></td>
<td>This is the tube that carries the messages from neuron to neuron. It connects to the synaptic buttons which send to the next set of dendrites. It is covered with fatty cells called myelin, which insulate the axon and make the nerve signal faster. This insulation can be built thicker in a stronger brain.</td>
<td>The axon is like an electrical wire, which needs insulation so that the electric signal will be transmitted clearly, just like an axon.</td>
</tr>
<tr>
<td><strong>Synaptic terminal/buttons</strong></td>
<td>These are located at the end of a neuron’s axon, and send the chemical messages off to the dendrites.</td>
<td>The buttons are like a launch pad for a space ship. They are a necessary base for sending something from one place to another.</td>
</tr>
</tbody>
</table>
Brainology® Unit 2 Brain Behavior: Vocabulary Builder

**Word Bank**

neurons  trillion  connections  dendrites

1. The brain is made up of nerve cells called ___________, in a network of over one ____________ connections.

2. Neurons communicate with each other through these ____________, using chemicals called neurotransmitters.

3. The branching part, called ____________ receive the message and the long part, called the axon, transmits a signal through the neuron.

**New information!**

- Thinking is affected by emotions - especially anxiety.
- When facing any threat - our body releases chemicals that make it hard to think (but easy to fight!)
- There are things YOU can do to counteract these physical responses.