THE TEEN BRAIN
Curriculum for High School Teachers

Module 3
The Teen Brain
What is happening in the brain during the teen years?

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Module 3 allows students to explore brain development during teen years, and unique limitations and affordances of this developmental period that can affect behavior and decision-making.

This module invites students to explore the questions:  
*What is happening in the brain during the teen years?*

While exploring this idea, students will:
- Understand the unique growth and plasticity that happens in the brain during the teen years.
- Describe teen behaviors that align with brain development during teen years.

The PowerPoint slides that accompany this module are meant to help guide the lesson, transitioning between activities and providing relevant information when necessary. Frequently engage students in discussion by asking questions, eliciting their prior knowledge, experience, and ideas. Examples of probing and reflective questions are embedded throughout the curriculum guide, to scaffold meaningful and relevant experiences for students.

**Time Frame:** 2 hours

**Activities:**
- Videos of Phineas Gage & teen brain development
- Teen stories
- Journal reflections/questions
- Pick topic for final presentation

**Preparation:**
- Make copies of [Teen Stories](#) and [Project Plan Worksheet](#) handouts.
- Load PowerPoint slides and videos on computer/tablet.
- Test out the video beforehand, to make sure bandwidth and connection are sufficient.

**Materials Needed:**

**Exploration 1: Prefrontal Cortex & Phineas Gage**
- Computer/tablet with PowerPoint slides
- Screen
- [Video about Phineas Gage](#)

**Exploration 2: Teen Stories**
- [Teen Brain video](#)
- Teen Stories handouts
- Pens/pencils
Exploration 3: Pruning & Plasticity
- Optional Teen Brain video

Journal Reflection
- Journal books or paper for each student
- Extra pens/pencils

Homework: Choosing Topic for Final Presentation
- Project Plan Worksheet handouts

Review (10 mins)
Driving Questions: How do the two sides/hemispheres of the brain communicate with one another?
How did having a split corpus callosum affect the man in the video we watched?
1. Review the content and activities from the last module using the PowerPoint slides, including the function of the corpus callosum and the right & left hemispheres.

Prefrontal Cortex & Phineas Gage (20 mins)
Driving Question: What is the role of the prefrontal cortex and how does it differ between humans and animals?
1. Explain that the frontal lobe, and a subset of that called the prefrontal cortex, are what help to make us uniquely human. It has evolved to be largest in humans compared with other animals. Ask students to reflect about why they think that is.
   a. The prefrontal cortex is responsible for high-level cognitive functions in decision-making, judgment, personality expression, moderating social behavior, etc.
   b. Ask students to discuss: “What do you think would happen if you lost your prefrontal cortex?”
2. Watch the Phineas Gage video to learn about a famous case study that allowed scientists to understand more about the function of the prefrontal cortex:
3. Discuss students’ reactions to the video: “What happened to Phineas Gage as a result of losing his prefrontal cortex? Did this surprise you? Why or why not?”

Teen Brain (45 mins)
Driving Question: What is happening in the brain during the teen years?
1. Ask students to discuss ideas about the brain during teen years. Note: Take time for many students to participate and add ideas or experiences, as this is an important component of students fully understanding and relating to this information.
   a. What do you think is happening in the brain during the teen years?
   b. At what age do you think the brain is matured (mostly finished growing)? Why?
2. Watch the Teen Brain Video: (STOP AT 3:08 “The teen years is an extremely vulnerable period.”)
3. Explain that the brain matures from back to front. During the teen years, the cerebellum, amygdala, and nucleus accumbens are very mature – physical activity, emotions, motivation for reward, etc. However the prefrontal cortex (regulation of impulses, judgment, etc.) is not as developed.
   a. Prefrontal cortex weighs outcomes, forms judgments and controls impulses and emotions.
      Understanding consequences and judging impacts of decisions isn’t as developed in teen years.
      The prefrontal cortex isn’t regulating your impulses.
   b. The parts of the brain that are more developed are reward centers – looking for pleasure, and take risks (without understanding consequences) in order to get it.
4. Introduce the Teen Stories activity. Explain that students should work with a partner or on their own. They will share a story from their lives or make up a realistic story about a teen that reflects what is happening in the brain during the teen years.
   a. Consider starting by sharing a personal experience from your teen years, which exemplifies the ways in which the teen brain operates—focusing on high reward and not on long-term consequences. Sharing an example from your past may allow students to feel more comfortable sharing their own stories or fictional stories based on things they know or have heard. After sharing your story, ask students to reflect: Was that a reasonable reaction? How is that reflective of a teen brain?
   b. After students have completed their stories, encourage a few to share their stories with the group.
   c. If desired for grading purposes, collect teen stories.

Short Break (10 mins)

Pruning & Plasticity (25 mins)
Driving Question: What else happens to the brain during the teen years?
1. There are changes in connections inside the brain during teen years:
   a. Briefly explain that the name for connections between cells inside the brain is called synapses. Mention that this topic will be explored more deeply later in the course, but for now, it’s important to understand that the amount of connections change over our lives.
   b. At age 3, children have over 1,000 trillion synapses, and by adulthood there are only half that many. Ask students to reflect: What do you think happens to half of these synapses over time? Why would adults have less than toddlers?
   c. Explain that pruning means decreasing connections that are no longer used or relevant, strengthening the connections that are used/relevant.
      i. Watch an optional short video about pruning in teen years video:
      ii. Provide an example: Babies have a lot of connections in the brain because they could be shaped in many different ways (e.g. language). Then their experiences and environment causes them to only need a subset of that, so the brain “prunes” away the ones that aren’t needed and keeps the ones that are, in order to be more efficient. Similar thing happens in adolescence/teen years.
   d. Explain that the maturation images show how the brain is still strongly developing, especially in the frontal lobes during younger years, gets more mature in teen years, and isn’t close to complete maturation until one’s 20s.
   e. Ask if students have heard of “use it or lose it”, and what that might mean. Explain that plasticity means that the brain is able to change, which is largely based on your behavior and what you do. Reinforcing good behaviors during teen years like working hard and learning new skills develop strong neural pathways for adulthood. Reinforcing bad behaviors like using drugs and alcohol during teen years develop dangerous pathways for adulthood that are harder to reverse than if these behaviors were developed after teen years.
      i. During teen years, the brain is looking for what is needed in my life right now, and what should I hold on to for the future.
   f. Ask students to reflect: What does this make you think about? Why are teen years important for brain development?
Journal Reflection (10 mins)

Driving Question: What are you thinking about after today’s session?

1. Encourage students to think about what they did and learned today. Ask them to consider and write about:
   a. What does that make you think?
   b. Where do you feel confused?
   c. What are you still curious to learn more about?

Homework Assignment: Tell students that they will be responsible for giving an individual presentation about the teen brain. For homework, they should complete the Final Presentation Topic Proposal form. They should pick a general topic that relates to the brain during the teen years (like drugs & teen brain, or sleep & teen brain), a more specific question for investigation (like how does marijuana affect the teen brain?) and three credible sources of information that they will use as part of their project.