

Nicotine and the Teen Brain

Help students understand why nicotine exposure is especially harmful for teenagers.

Objective

Students will analyze informational text about the teen brain and explain why teens are more vulnerable to nicotine addiction.

Standards

CCSS ELA

- RI.1 Make logical inferences from a text
- RI.7 Integrate information in different formats
- W.1 Write arguments using valid reasoning and evidence

C3

- Grs. 9–12: D4.1 Construct arguments using evidence

NGSS

- Grs. 6–8: LS1.D Information Processing
- Grs. 6–12: Obtaining, Evaluating, and Communicating Information
- Grs. 6–12: Cause and Effect

Time

50 minutes

Materials

- Laptops and internet access for watching the video “How Does Vaping Harm Your Health?” (see Videos + Online Resources links at right)
- Addiction and the Teen Brain activity sheet
- Extra sheet of paper

1 Write the words “nicotine” and “addiction” on the board. Ask students what they know about these words, and have them write a word or phrase about each on the board. (Answers may include: *nicotine: found in cigarettes; addictive; dangerous; not sure, etc.; addiction: drugs; can’t stop doing something; cravings, etc.*) Discuss their responses.

2 Define addiction: *a brain disorder or illness associated with compulsive behavior, such as drug use, despite negative consequences.* Discuss what someone who is addicted to nicotine might experience.

3 Watch the video “How Does Vaping Harm Your Health?” After watching, ask for volunteers to explain why using e-cigarettes could put someone at risk for addiction.

4 Separate the class into pairs and hand out the Addiction and the Teen Brain activity sheet. Have students work together to complete the activity.

5 Hang sheets of paper with the words *cerebral cortex, cerebellum, brain stem, and limbic system* in different areas of the room. As pairs finish the activity sheet, ask them to think of a specific action they do regularly, such as figuring out a math problem. Have them write the activity on a sticky note and place it under the part of the brain involved. Encourage them to consider whether an action involves more than one area. (Examples: *playing the piano: cerebellum [coordination] + cerebral cortex [reading music]; reading a text message: cerebral cortex [processing information] + limbic system [emotions].*) Discuss some of the actions listed under each brain region.

6 Discuss the Think It Through questions at the bottom of the activity sheet. As part of your discussion, ask students why taking risks can be beneficial during adolescence. (*For example, it helps teens take on new challenges and is an important part of developing into an adult.*) Encourage students to share some of the positive ways



in which they support their development, such as by making healthy choices and learning new skills.

7 Assess students by having them write a 150- to 200-word informative essay that supports the following statement: *Teens are especially at risk for the potential health hazards of using e-cigarettes.* Remind them to use evidence from the diagram and your discussion to support their explanations.

Answers to Activity Sheet

1. The prefrontal cortex is not fully developed until the mid-20s. This is the area that controls critical thinking and weighing pros and cons to make decisions.
2. Nicotine causes the limbic system to release large amounts of dopamine, which leads to feelings of pleasure and encourages the person to repeat the behavior. Over time, surges of dopamine can lead to addiction.
3. The limbic system in the teen brain is more sensitive to the effects of dopamine, the chemical that is linked to addiction.
4. The critical-thinking and information-processing area of the brain undergoes critical development during the teenage years. Engaging in activities such as learning new skills, sports, music, etc., can help strengthen connections in this part of the brain.

Videos + Online Resources

- Middle school students: [scholastic.com/vapingrisks](https://www.scholastic.com/vapingrisks)
- High school students: [scholastic.com/teenvapingrisks](https://www.scholastic.com/teenvapingrisks)
- Teachers: [scholastic.com/youthvapingrisks](https://www.scholastic.com/youthvapingrisks)

Cessation Resources

Visit the “More Educational Resources” section of the teacher site to locate cessation resources for teens, families, and teachers.

Addiction and the Teen Brain

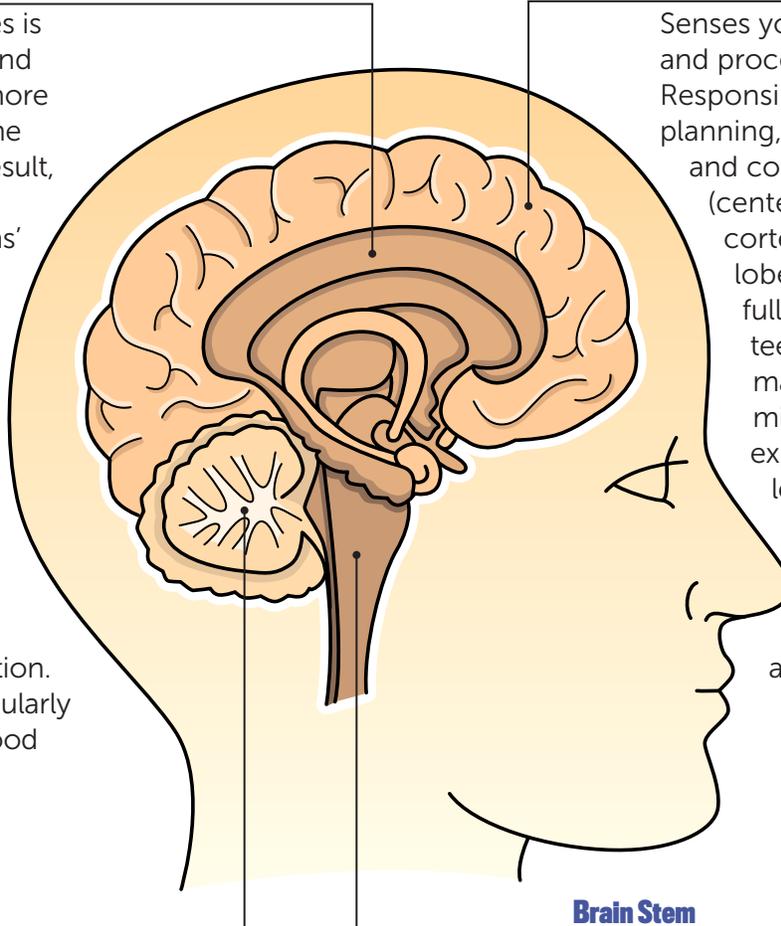
Your brain is still developing during your teenage years. This can make you more vulnerable to the effects of drugs like nicotine, which is found in tobacco cigarettes and many e-cigarettes. Study the diagram below, then use a separate sheet to answer the questions.

Limbic System

This group of structures is involved in emotions and memory. It develops more quickly in teens than the cerebral cortex. As a result, emotions often have a greater impact on teens' decision-making. The limbic system also controls the release of dopamine, a natural chemical that delivers feelings of pleasure. Drugs like nicotine cause a larger dopamine release than other activities, which over time can lead to addiction. The teen brain is particularly sensitive to the feel-good effects of dopamine.

Cerebral Cortex

Senses your surroundings and processes information. Responsible for critical thinking, planning, and weighing pros and cons to make decisions (centered in the prefrontal cortex area of the frontal lobe). This region is not fully developed in your teens, and continues maturing through your mid-20s. All of your experiences, such as learning new skills and activities, cause connections between brain cells to be strengthened and modified.



Cerebellum

Processes sensory information from other parts of the brain and controls voluntary muscle movement, coordination, balance, and speech.

Brain Stem

Controls the flow of signals between the rest of the body and the brain. Also controls involuntary body functions such as breathing, heart rate, and swallowing.

THINK IT THROUGH

1. Why do teens tend to make riskier decisions than adults? Use evidence to support your answer.
2. Describe the brain processes that can lead a person to become addicted to nicotine.
3. Why are teens more vulnerable to nicotine addiction than adults? Support your answer with evidence from the diagram.
4. Explain how a teen's decisions can affect their brain. What advice would you give teens to help them strengthen their brains as they mature into adults? What actions can teens take to help support their brain development?