Everything You Need to Know about Drugs and the Teen Brain in 22 Minutes

LESSON PLAN

By Leanne Arnow
B.A. Vassar College
M.A. NYU, Steinhardt School
Teaching Point:
Drugs and the Teen Brain

Subject Area: Health Education

Grade Level: 9-12

Time Frame: One class period

Relevant Standards:
(National Health Education Standards, Grades 9-12)

1.12.4 Analyze how genetics and family history can impact personal health.

1.12.9 Analyze the potential severity of injury or illness if engaging in unhealthy behaviors.

2.12.6 Evaluate the impact of technology on personal, family, and community health.

3.12.2 Use resources from home, school, and community that provide valid health information.

5.12.1 Examine barriers that can hinder healthy decision making.

5.12.6 Defend the healthy choice when making decisions.

6.12.1 Assess personal health practices and overall health status.

7.12.1 Analyze the role of individual responsibility for enhancing health.

7.12.3 Demonstrate a variety of behaviors to avoid or reduce health risks to self and others.

Learning Objectives:
Students will be able to…

• Recognize the dangers of using drugs during adolescence, when the brain is undergoing crucial development.

• Identify several parts of the brain that are affected or damaged by drugs.

• Explain how alcohol, marijuana, and other drugs affect various brain functions.

• Understand the neurological mechanisms of tolerance, dependence, and addiction.

• Describe how the brain rewire as a person recovers from drug addiction.

• Draw the connection between drug-induced changes in the brain and short- and long-term changes in behavior and mood.
Materials:

- All You Need to Know about Drugs and the Teen Brain in 22 Minutes Teacher’s Resource Book and video
- 2 copies of the pre/post-test per student (see attached page 8 for template)
- homework assignment page for each student (see attached page 12 for template)
- 2 copies of pre/post assessment rubric (see attached page 11 for template)
- chart or board to write on

Advanced Preparation:

- Optional: Give students the pre-test and fill in the pre-assessment rubric before teaching the lesson. Use the data to help you differentiate the lesson.
- Prepare a chart like the one below and post it on the board or wall before class:

Drugs and the Teen Brain
Brain Function    Brain Structure    Drug Effects

Vocabulary:

- abuse
dopamine

- addiction
euphoria

- cerebellum
hippocampus

- cerebral cortex
neuron

- circuitry
neurotransmitters

- dependence
plasticity

- depressant
tolerance
Procedure:

Motivation

- Tell the class that today’s lesson will be about how drugs affect the brain. Show students the chart you made and ask them to name some brain functions they know. List their responses on the chart under *brain functions*.

*Teacher Note:* The brain functions discussed in the video are: thinking, learning, attention, memory, judgment, planning, inhibition, sensory processing, balance, coordination, emotions, motivation, pleasure, breathing, and heart rate. If students name very broad functions like *staying alive*, ask for a more specific function like *breathing*. If multiple students name similar activities like *running* and *swimming*, lump their responses together under a broader name like *movement*.

Adaptation for gifted students:

As students name brain functions, ask them to identify any brain structures they know that control each function. Write their responses on the chart under *brain structures*. If any students know how drugs can affect those brain functions, write their responses under *drug effects*.

Adaptation for English Language Learners:

Give English Language Learners access to a translation dictionary during the activity and clarify the meaning of any difficult words students use to describe a brain function, like *sensory* or *perception*. It is also a good idea to give ELL students the vocabulary words for the lesson ahead of time.

Adaptation for students with special needs:

Some students may not know that the brain controls more than just thinking. If students have trouble naming other functions, tell them that thinking is one of the brain's biggest jobs, but the brain controls other things too. Write the following brain functions in the first column: *movement*, *emotions*, *the five senses*, and *automatic body functions*. Ask students to think of a few examples of each, and write their responses on the chart.

Show the video

- Tell students that they will be watching a video about drugs and the teen brain. Tell them to pay close attention to how drugs affect different brain structures and functions.

*Teacher Note:* After the video, you will be asking the class to help you fill in the rest of the chart. If you think your students will have trouble remembering the different brain structures, fill in that part of the chart yourself as you watch the video.
**Activity**

- Invite students to share their thoughts and reactions to the video. Then direct their attention back to the chart and ask them to help you fill in the remaining columns. You can use the sample chart below as a guide.

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### Drugs and the Teen Brain

<table>
<thead>
<tr>
<th>Brain Function</th>
<th>Brain Structure</th>
<th>Drug Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>automatic functions: heart rate, breathing, blood pressure, digestion</td>
<td>brain stem</td>
<td>increases heart rate &amp; blood pressure, causes vomiting, difficulty breathing, coma, death</td>
</tr>
<tr>
<td>movement: coordination, balance</td>
<td>cerebellum</td>
<td>impairs balance and coordination</td>
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<tr>
<td>memory</td>
<td>hippocampus &amp; amygdala</td>
<td>interferes with memory - effect can last long after the drug is taken; forms memories of the drug that cause cravings and make recovery difficult</td>
</tr>
<tr>
<td>higher-level thinking: language, perception, planning, judgment, problem solving, sensory processing</td>
<td>cerebral cortex</td>
<td>slows thinking, impairs sensory processing, lowers inhibitions, clouds judgment, causes attention &amp; learning deficits, distorts perception</td>
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<tr>
<td>reward: pleasure, motivation</td>
<td>reward pathway (neurons and neurotransmitters in different parts of brain)</td>
<td>tricks reward pathway into activating, raises dopamine levels inability to feel pleasure from anything else</td>
</tr>
<tr>
<td>processing information</td>
<td>white matter</td>
<td>makes transmitting information from one part of the brain to another less efficient</td>
</tr>
</tbody>
</table>
**Discussion**

- Engage the class in a discussion using the questions below as a guide. You can begin filling out the post-assessment rubric as you listen to their comments.

**Discussion Questions**

- Why are drugs even more dangerous for adolescents than they are for adults?

- What can you do to protect your developing brain during adolescence?

- When someone has a drug addiction, do you think they control the drug or the drug controls them? At what point, if any, do you think the drug takes control of their brain?

- A generation ago, scientists didn’t know nearly as much about how drugs affect the brain. What would you tell an aunt or uncle who says that alcohol doesn’t mess with your brain like drugs do.

- As research reveals new information about drugs, do you think any laws should change? The drinking age? Cigarette laws? Medical marijuana? Anything else?

- Advances in technology have allowed scientists to learn more about how drugs work. This has led to better treatments for drug addiction but also dangerous synthetic drugs like ecstasy. When it comes to the future of drugs, do you think science will be the solution or just fuel the problem?
Wrap up/Assessment

- Cover the chart and pass out the post-test. Give students 5 or 10 minutes to complete it.

- As you grade the tests, finish filling out the post-assessment rubric.

Homework

- Pass out the homework assignment page and read the directions. Tell students that when their parents were their age, much less was known about how drugs affect the brain. Explain that their homework assignment is to interview an adult (this can be a teacher or someone at home) to find out what they know about drugs and the brain. Plan to have students share the results of their interviews during the next class.
Pre/Post Test

Name: _______________________________________________

Directions: Answer each multiple choice question by circling the correct response.

1. Which of these statements is true about teenagers who try drugs?
   a. they are less likely to do drugs as adults because they already know what it is like
   b. they are unlikely to become addicted because they are so young
   c. they can end up with irreversible brain damage from drug exposure
   d. they are better off tying drugs now because it is easier to recover if they get hooked

2. Which part of the brain controls higher-level thinking?
   a. cerebellum
   b. cerebral cortex
   c. brain stem
   d. hippocampus

3. Which of these statements about brain development is NOT true?
   a. the brain is always changing, but it goes through a major development phase during the teen years
   b. the brain finishes developing when a person stops growing
   c. the choices a person makes in life can impact their brain development
   d. if one part of the brain becomes damaged, another part can take over its function

4. When a person develops a drug tolerance, what has happened to their brain?
   a. it has started using the drug instead of glucose for energy
   b. it has started making the drug
   c. it has lost its ability to regulate breathing
   d. it has adjusted to the presence of the drug

5. In high doses, alcohol can make a person stop breathing because it has affected their
   a. cerebellum
   b. cerebral cortex
   c. brain stem
   d. hippocampus
6. Which brain difference has been found in teenagers who drink alcohol?
   a. smaller hippocampus
   b. less efficient white matter
   c. less activation in the cerebral cortex during a memory task
   d. all of the above

7. Addictive drugs activate the brain’s reward system by raising levels of which chemical?
   a. nicotine
   b. hormones
   c. dopamine
   d. histamines

8. How does TCH, the chemical in marijuana, impair brain function?
   a. it attaches to cannabinoid receptors in the brain
   b. it attacks and kills healthy brain cells
   c. it causes the brain to produce a toxic gas
   d. it temporarily paralyzes brain cells

9. What causes drug cravings in recovering addicts?
   a. certain foods
   b. brain damage
   c. peer pressure from other drug users
   d. cues in the environment that trigger memories of the drug

10. Which statement is true about a person whose brain has been damaged by drugs?
    a. they can recover because their brain can make new connections
    b. they can never recover because brain damage is permanent
    c. if they survive, they will remain in a coma
    d. they can recover if their brain produces new kinds of neurotransmitters
Post-Test Answer Key

1. c
2. b
3. b
4. d
5. c
6. d
7. c
8. a
9. d
10. a
**Pre/Post Assessment Rubric**

Record each student's performance by writing a 1, 2, or 3 in each box, or use your own grading scale.

**Key:** 1 = not meeting expectations  
2 = approaching expectations  
3 = meets expectations

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<tr>
<th>Student:</th>
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**Homework Assignment:**

**Directions:** You have just learned cutting edge information about how drugs affect a person's brain. Many adults can tell you that drugs mess with your brain, but they can't tell you how. Interview an adult to find out how much they know about drugs and the brain.

**Person being interviewed:** ________________________________________________

Write three things the person knew about how drugs affect the brain.

1. __________________________________________________________
2. __________________________________________________________
3. __________________________________________________________

Write three things the person did NOT know about how drugs affect the brain.

1. __________________________________________________________
2. __________________________________________________________
3. __________________________________________________________

What surprised you the most about the person’s responses?

__________________________________________________________

__________________________________________________________

__________________________________________________________
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