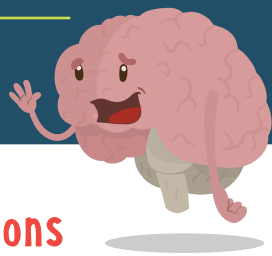
LESSON 8

HOW MARIJUANA AFFECTS THE DEVELOPING BRAIN

Marijuana

Length: 30-45 minutes | Age Range: Designed for 5th and 6th grade



Summary

The *Ask, Listen, Learn* video series and supplemental lesson plans have been designed to teach kids about the impact alcohol has on the developing brain, the short and long-term consequences of underage drinking, and how to make healthy decisions. In this 8th installment, the curriculum will focus on how marijuana affects the developing brain and risks associated with youth use. Here, students will learn the basics of the endocannabinoid system, how marijuana obstructs its regular function, how that can affect their body and behavior, and how they can make smart choices. This lesson is designed to follow the first seven videos and lesson plans but can be used as a freestanding unit as well. Before you get started, be sure to read the Educator Primer on Marijuana and the *Ask, Listen, Learn* Facilitator's Guide.

Materials:

- Marijuana Comprehension Questions
- Marijuana Vocabulary Cards
- Chemical Messages Sheet with THC
- Chemical Messages Sheet No THC
- Enzyme Code Key
- Decision-Making Worksheet
- Kahoot! Games (Optional)

Objectives

Students will:

1. Identify the three parts of the endocannabinoid system and understand its function
2. Communicate the way in which marijuana affects the endocannabinoid system
3. Understand the risks associated with youth marijuana use including addiction and mental health issues
4. Demonstrate the ability to make healthy decision

Comprehension Questions

- What are the three parts of the endocannabinoid system?
- What does the endocannabinoid system do?
- What are three ways marijuana can be taken?
- What does THC do to the endocannabinoid system?
- What are some of the risks that marijuana use in kids can lead to?

Vocabulary

- Marijuana
- Cannabis
- Endocannabinoid system
- Endocannabinoids
- Cellular receptors
- Enzymes
- THC
- Vaping or vaporizer
- Cognitive damage
- Motor skills
- CBD
- Medical marijuana

For your next class...

How Alcohol Affects Your Developing Brain

To learn more about teaching units on the impacts of underage drinking and peer pressure, see additional lessons from *Ask, Listen, Learn*

See all lessons

ask listen learn

Kids and alcohol don't mix.

For more info head to **AskListenLearn.org**

EDUCATOR INSTRUCTIONS

Marijuana

1. Introduce the unit by playing, **"Video 8: How Marijuana Affects Your Developing Brain."** Ensure every student has a paper or virtual copy of the Comprehension Questions to answer as they watch the video.
2. When the video is over, have the students get into groups or Zoom rooms to discuss the questions.
3. Bring the class back together for a discussion. Start by clarifying that marijuana, like alcohol, is OK for some adults to use, but not for kids because it impairs the developing brain. Make sure to note that in some medical cases, marijuana can be used as medicine when deemed appropriate by a doctor.
4. Lead a discussion on the endocannabinoid system and review the three parts (endocannabinoids, cellular receptors, and enzymes). Explain that when someone uses marijuana, it sticks around in and disrupts their system because the enzymes can't break it down, making it harder to for the brain to perform basic functions. More information about the endocannabinoid system can be found in the Educator Primer on Marijuana.
5. ***Activity 1*** – Break the Code
6. ***Activity 2*** – Decision-making Activity
7. Pass out or send link to the vocabulary cards. For homework, ask the students to rewrite definitions for the vocabulary in their own words, and draw a picture to help them remember

Watch the Video

"How marijuana affects your developing brain"

Watch

ACTIVITY: BREAK THE CODE

Share the following messages with your students:

1. Endocannabinoids communicate very carefully with receptors throughout your body, sending all sorts of important messages that help you with memory, keeping hunger and body temperature in balance, and coping with stress and anxiety.
2. We're going to review a message that the endocannabinoids are trying to send. First, we're going to try to decode a message that has been impaired by THC. We will come back together and discuss what we think it means.
3. Then, we will try to decode a message that has NOT been impaired by THC.

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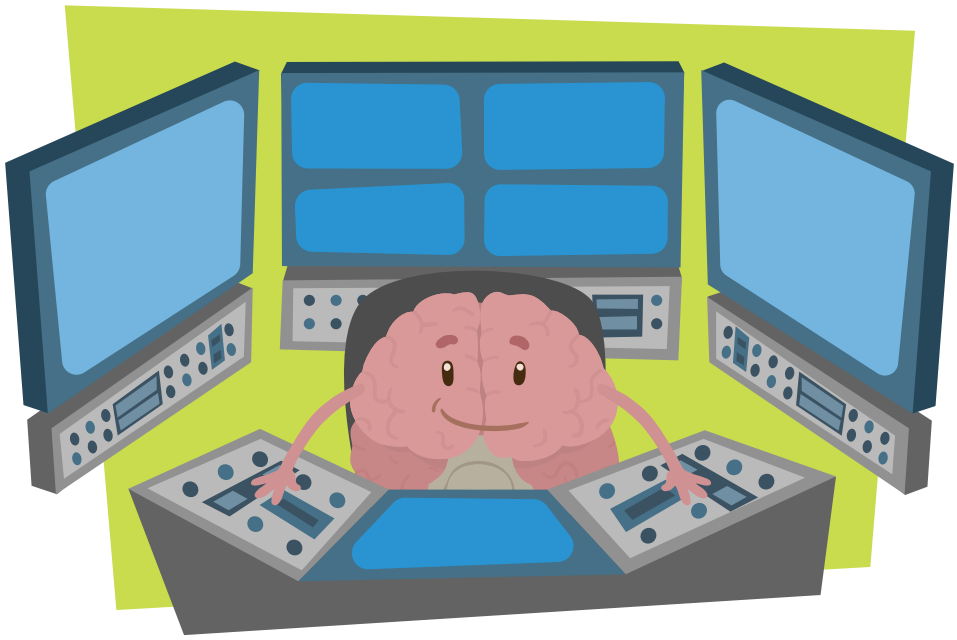
Instructions:

1. Break students out into groups or Zoom rooms and let them spend 10 minutes decoding the first set of chemical messages, “Impaired by THC”
2. Come back together as a class and ask the students if anyone could figure out what the message is. Lead a discussion with the following questions
   - a. Why do you think it might be difficult to understand the message?
     - i. THC throws the system off, making it harder for endocannabinoids to deliver their messages – things in the body get confused.
   - b. So, if developing brain is impaired by THC, what might be some of the effects?
     - i. Harder time remembering things
     - ii. Problems coping w stress and anxiety
     - iii. Trouble regulating body temperature and hunger
     - iv. Potential for long-term harm, addiction, and mental health problems.
3. Break students out into groups or Zoom rooms for a second time, and let them spend 10 minutes decoding the second set of chemical messages, “Not Impaired by THC”
4. Come back together to reveal the message and lead a reflection
   - a. How does THC affect the developing brain?
   - b. Is it easier for the body to send important messages and regulate your functions with or without THC in the system?
   - c. Remember, THC throws off the precise coordination of endocannabinoids, making it harder for them to communicate important messages to keep the body balanced. Long-term use of marijuana can lead to long-term health consequences by continuing to throw the body off balance.



LESSON 8

EDUCATOR PRIMER ON MARIJUANA

Marijuana

Introduction

Educators play a critical role in supporting kids as they learn to make healthy choices and smart decisions. *Ask, Listen, Learn's* "How Alcohol Affects the Brain" videos and corresponding classroom lessons have been designed to teach kids about the physical impact underage drinking has on the developing brain and body, providing educators with versatile classroom resources to facilitate conversations about underage drinking with students, while teaching them about the scientific effects of what they put in their alcohol on still developing bodies.

The newest addition to the program includes a unit on how marijuana affects a teen's developing brain and body. This content may seem unfamiliar, and we've heard from teachers and counselors across the country that they don't have the resources they need to teach their students about marijuana.

Ask, Listen, Learn approaches prevention education from a scientific perspective to share the facts with kids in an engaging way. Our focus on the developing brain is at the core of our curriculum; when adding this unit on marijuana, we wanted to maintain the same focus, which led to learning about how marijuana impacts the endocannabinoid system.

So – before you get started in the classroom, please review the following primer with information on:

- **The endocannabinoid system – what it is, how it works, and why it's important for your students to learn about**
- **The marijuana plant – its different parts and properties (THC vs CBD)**
- **A note legalization and medical marijuana**

The Endocannabinoid System

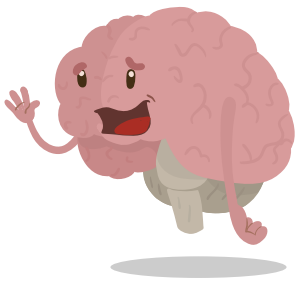
The endocannabinoid system is a biological system in the brain consisting three parts:

- Endocannabinoids
- Cellular receptors
- Enzymes

While scientists knew that THC affected the brain, the endocannabinoid system wasn't discovered until the early 1990s when scientists identified receptors in the brain that THC would bind to – Cannabinoid Receptor 1 or CB1 (on brain cells) and Cannabinoid Receptor 2 or CB2 (on immune tissue and immune cells). The endocannabinoid system was thus named after the plant THC comes from, marijuana.

Later, scientists found that the brain makes its own chemicals that bind to these receptors. These chemicals, called endocannabinoids, are released by brain cells receiving messages from other cells. The endocannabinoids serve as an "off switch" to tell cells that the message has been received. This transmission of feedback to the cells makes endocannabinoids a key piece in regulating brain functions.

Endocannabinoids are eventually broken down by enzymes – together, this system creates balance in the brain and influences many functions, including motor control, memory, emotions, and more.



For your next class...

How Alcohol Affects Your Developing Brain

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EDUCATOR PRIMER ON MARIJUANA

Marijuana

Marijuana is a plant that has been harvested for thousands of years – the plant has exudes a sticky resin that contains many natural chemicals. Two of the main ones are THC and CBD. Cannabis and marijuana are often used interchangeably – in the *Ask, Listen, Learn* program, we use the word marijuana for student-facing content, as our formative research taught us that was the verbiage students aged 9 - 13 are most familiar with.

- THC (Delta-9-tetrahydrocannbidiol)
  - Psychoactive
  - Binds to CB1 receptors and doesn't get broken down by enzymes like an endocannabinoid would
  - FDA approved in very select medical scenarios related to HIV and chemotherapy induced nausea
- CBD (Cannabidiol)
  - Non-psychoactive
  - Blocks CB1 receptors
  - Not intoxicating or addictive
  - FDA approved for use in two subtypes of seizures
  - No specific age limit for use but most retailers will not sell to persons under 18

THC is the substance that makes people "high" from marijuana use, and it can be used in many forms:

- Marijuana plant
  - Leaves, stems, and flowering buds of the plant can be dried and smoked
- Edibles
  - Multiple varied forms of baked goods, candies, and beverages that can look like regular foods.
- Vaping liquid
  - THC solution is vaporized by wicking it up and exposing to heat source
  - Does not produce smoke, but produces vapor
- Marijuana concentrates
  - Concentrates are extracted from the marijuana plant, making them more potent than the plant itself. Common concentrates include hash, rosin, resin, tinctures, and more

Legalization and Medicinal Use

Recreational marijuana is legal in 11 states and the District of Columbia for adults over the age of 21, legal for medicinal use in 33 states, and still federally illegal. The landscape of marijuana legalization is constantly changing. **The crucial, general message is that marijuana use for anyone under the age of 21 is illegal and potentially harmful to the developing brain and body.**

There are some extreme exceptions for youth use marijuana products (virtually always a CBD preparation, and not THC) in the case of serious medical conditions. **When teaching this content, please make it clear that marijuana is sometimes used as a medicine in specific instances so as not to isolate a child who may be living with those circumstances.**

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DEAR PARENTS,

As a school counselor and health and wellness teacher in a K-8 school, I often field questions about the appropriateness of teaching preteens about cannabis. I understand parents' instinct to delay the discussion until their child is older, but that's not protective. It's a missed opportunity, and it may even backfire.

If that seems counterintuitive, consider the developmental phase. Young adolescents are years away from having a fully formed prefrontal cortex and as a result they're more likely to take unhealthy risks--and less likely to predict the consequences of their actions. They need their parents and teachers to arm them with good information, help them identify safe risks, and preview pressure-filled or tempting scenarios.

Tweens are getting bombarded daily with data -- both accurate and inaccurate -- from friends, the 24-7 news cycle and social media. That means they're also getting subjected to a lot of bad information. Tweens hate to be manipulated, and adults can use that to their advantage by pointing out when others try to mislead them into believing that cannabis can't harm their still-developing brain.

Cannabis *can* harm kids, but scare tactics are ineffective. The best way to reach a young adolescent is to honor their intellect, treat them as the expert in their own life, avoid lecturing, focus on developing their critical-thinking skills, and give them age-appropriate, factual information.

The *Ask, Listen, Learn* unit on cannabis is designed to do just that. It covers everything from the risks associated with youth use, to how cannabis affects a tween's developing brain, body and behavior, to the basics of the endocannabinoid system. It gives kids the tools they need to draw their own conclusions and make smart, healthy decisions both now and down the road. That's a real gift.

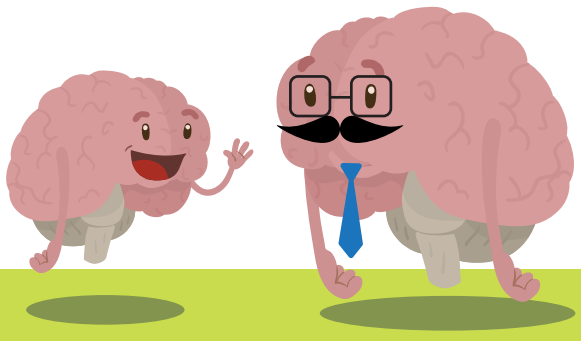
The data underscores the need to tackle the topic directly with tweens. According to the Food and Drug Administration, e-cigarette use by middle schoolers spiked 48% from 2017 to 2018. *The New England Journal of Medicine* recently reported that 9% of eighth graders used e-cigarettes in the past 30 days -- more than double what it was just two years ago. This is significant because researchers from the University of Pennsylvania and the University of Southern California reported in the journal Pediatrics that 14-year-olds who tried e-cigarettes were three times more likely to try marijuana than students who hadn't tried them.

Prevention takes a village. *Ask, Listen, Learn's* lesson is interactive and comprehensive, but kids need their parents to talk to them about substance use as well. At home, approach your child from a stance of calm curiosity. You can ask, "What have you heard about cannabis?" or "Do you think you know more or less than what I think you know?" or "Do you think most kids think it's dangerous to use marijuana?" Practice your poker face and stay nonreactive if they say something shocking. You want to make it safe for them to be honest and open.

I recognize that this entire topic may feel overwhelming--much like raising a tween!--but half the battle is being willing to have the conversation. The *Ask, Listen, Learn* lesson can provide your child with solid, developmentally appropriate information, but they still need you to impart your values, beliefs and expectations.

Sincerely,

Phyllis L. Fagell, LCPC
School Counselor
Author of "Middle School Matters"



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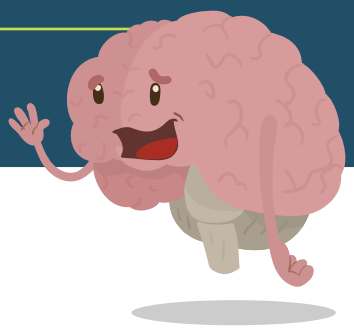
Vocabulary Words



Marijuana (mar·i·jua·na)
A common word for the plant called cannabis. Marijuana can be smoked, vaped, or ingested and contains high levels of THC, which can negatively affect the developing brain.

THC
A chemical from the cannabis plants that can negatively affect the developing brain.

Cannabis (can·na·bis)
A plant that can be smoked, vaped or ingested and contains high levels of THC, which can negatively affect the developing brain.

Neuron (neu·ron)
A nerve cell; a special cell that carries messages between the brain and other parts of the body.

Neurotransmitter (neu·ro·trans·mit·ter)
A chemical substance that carries a message from one neuron to another.

Endocannabinoid system (en·do·can·na·bi·noid sy-stem)
A system in the brain that helps keep the brain and body in balance. It has three parts: endocannabinoids, cellular receptors, and enzymes.

Endocannabinoid (en·do·can·na·bi·noid)
Natural messengers in the brain that communicate with cellular receptors.

Cellular receptors (cel·lu·lar re·cep·tor)
Places on neurons where neurotransmitters stick onto to deliver their message.

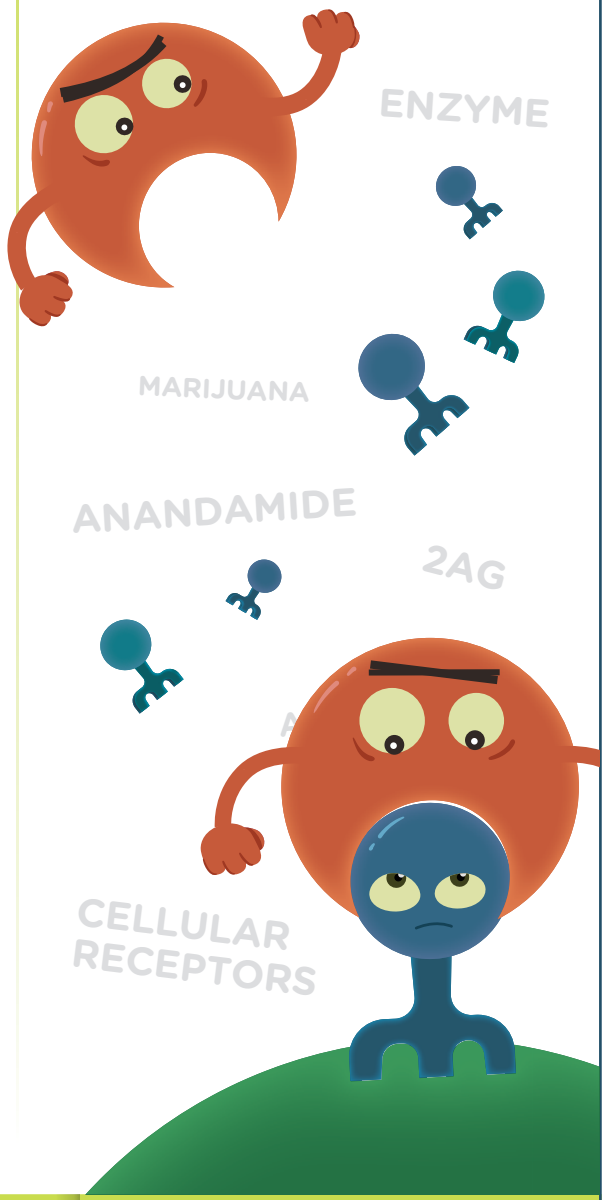
Enzyme (en·zyme)
Chemicals your body makes to break down things like neurotransmitters when they're done delivering their message.

Vaporizer (va·por·iz·er)
An electronic device, sometime called a vape for short, that heats up liquids and solids and turns them into vapor — marijuana can be vaped.

Cognitive damage (cog·ni·tive dam·age)
Harm to the brain the makes it hard to learn new things, focus, or make smart choices.

CBD
A chemical from cannabis plants that does not affect the brain.

Medical marijuana (med·i·cal mar·i·jua·na)
Marijuana that is prescribed by a doctor and is used to treat a some very serious medical conditions.



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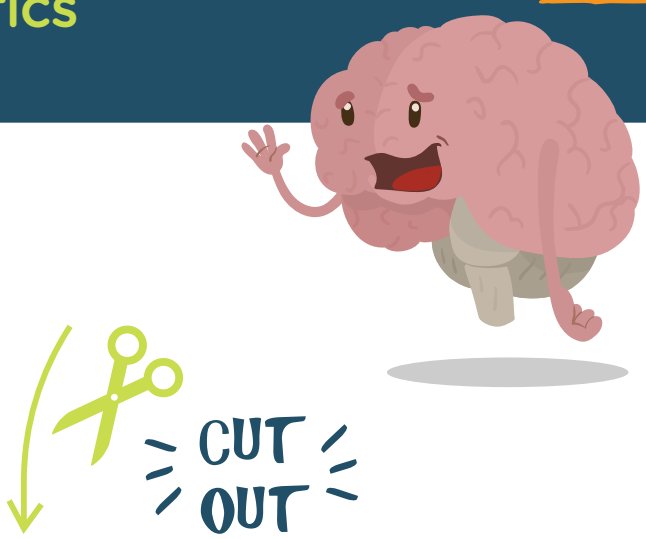
LESSON 8 VOCABULARY WITH PHONETICS

Marijuana

(mar•i•jua•na)



THC

Cannabis

(can•na•bis)

Neuron

(neu•ron)

Neurotransmitter

(neu•ro•trans•mit•ter)

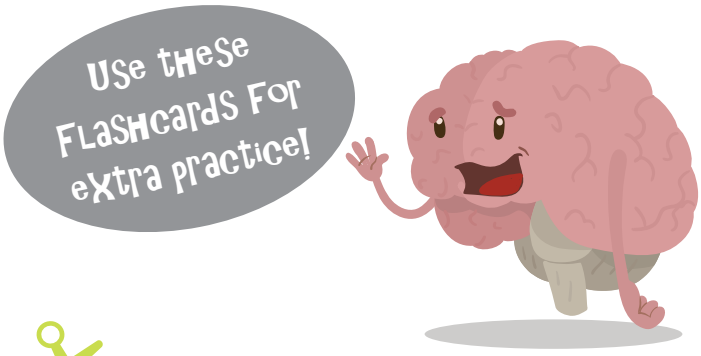
Endocannabinoid system

(en•do·can•na·bi·noid sy-stem)

Endocannabinoid

(en•do•can•na•bi•noid)

VOCABULARY WITH PHONETICS



A common word for the plant called cannabis. Marijuana can be smoked, vaped, or ingested and contains high levels of THC, which can negatively affect the developing brain.

A plant that can be smoked, vaped or ingested and contains high levels of THC, which can negatively affect the developing brain.

A chemical from the cannabis plants that can negatively affect the developing brain.

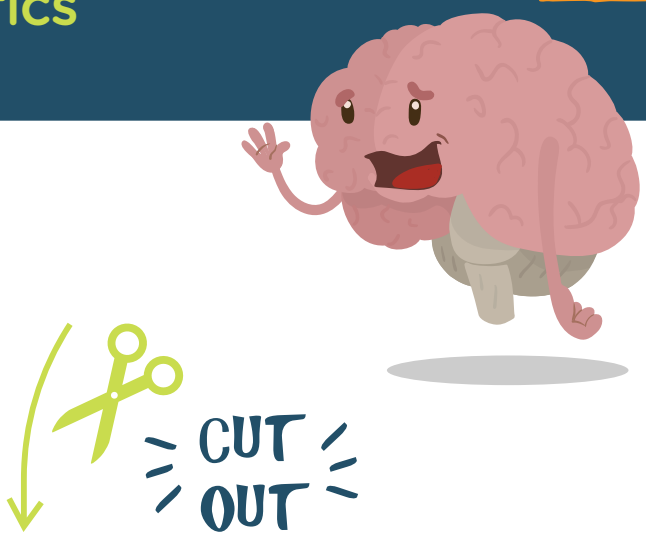
A chemical substance that carries a message from one neuron to another.

A nerve cell; a special cell that carries messages between the brain and other parts of the body.

Natural messengers in the brain that communicate with cellular receptors.

A system in the brain that helps keep the brain and body in balance. It has three parts: endocannabinoids, cellular receptors, and enzymes.

Marijuana



Cellular receptors
(cel•lu•lar re•cep•tor)

Enzyme
(en•zyme)

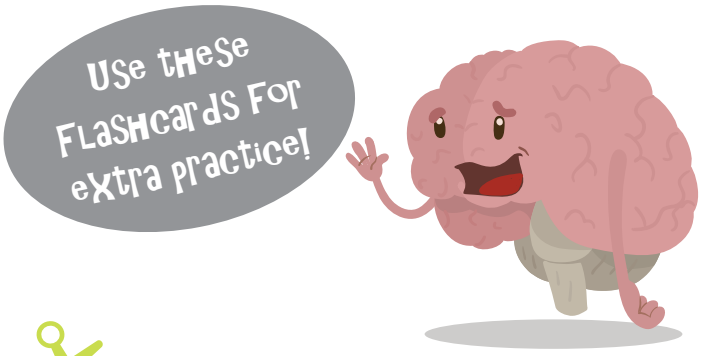
Vaporizer
(va•por•iz•er)

Cognitive damage
(cog•ni•tive dam•age)

CBD

Medical marijuana
(med•i•cal mar•i•jua•na)

VOCABULARY WITH PHONETICS



Places on neurons where neurotransmitters stick onto to deliver their message.

An electronic device, sometime called a vape for short, that heats up liquids and solids and turns them into vapor — marijuana can be vaped.

Chemicals your body makes to break down things like neurotransmitters when they're done delivering their message

A chemical from cannabis plants that does not affect the brain.

Harm to the brain the makes it hard to learn new things, focus, or make smart choices.

Marijuana that is prescribed by a doctor and is used to treat a some very serious medical conditions.

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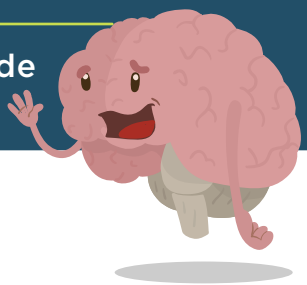

Enzyme Code Key #1

A	B	C	D	E	F
					
G	**H**	**I**	**J**	**K**	**L**
					
M	**N**	**O**	**P**	**Q**	**R**
					
S	**T**	**U**	**V**	**W**	**X**
					
Y	**Z**				
					

For your next class...

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See all lessons

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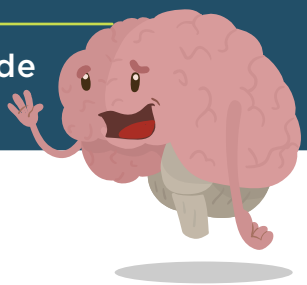

Chemical Messages

Impaired by THC	Write your answer
	
	
	
	
	
	
	

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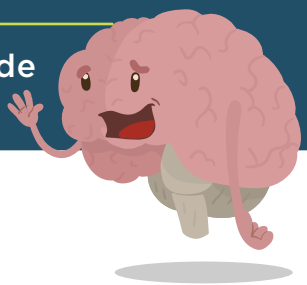

Chemical Messages

No THC	Write your answer
	
	
	
	
	
	
	

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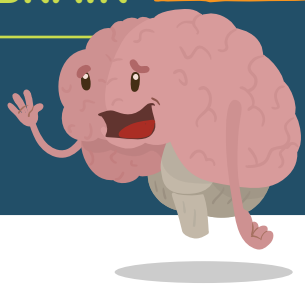
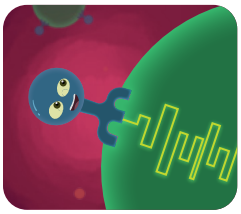


Comprehension Questions
Be sure to write your answers in full sentences and cite evidence from the video.

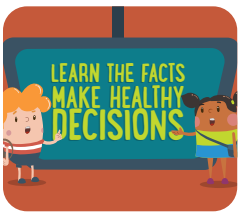
1 What are the three parts of the endocannabinoid system?



2 What does the endocannabinoid system do?

3 What are three ways marijuana can be taken?

4 What does THC do to the endocannabinoid system?



5 What are some of the risks that marijuana use in kids can lead to?

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Brain WORD Search

How Marijuana affects the developing brain

N P Q S S E N B E X S C H Q C J U B W V L L B Q Q
Y J D V X Z R H F A S K L I S T E N L E A R N S D
U O V Q Z D A L O S Z N I F R B I D L D I C D C K
G R D D J D I Y L I E X E L U I A O Q U L O Z A T
A T D E N D O C A N N A B I N O I D P S U P T T O
P X N T L Q E N D K K G A M W D A M Q S C J D N M
T P O S C E L L U L A R R E C E P T O R C B Y X D
M G H E A U R N L I S H F W I B B E Q T U R X P R
W M G T N N N E Y R V Z Q X E U O N G I X P O P D
B J L O N J O U D Q E N F I K S V N I M R Z L N R
R R N H A K N R Q T L C S Z J V K E C S A D G Y A
E E I V B F P O R Q J V R M Y Q Y S T J A E K M W
S G R J I J L N E J Q Z N E A A X O N M W P K O D
Y G L U S Q G N N R B L U D A R L K O V N N N G X
Q R A G Q D C D Z G Y K O I N T I Z Z N J G Q F T
S J L B Q T O L Y G D L M C O G I J K U N P O F M
G N K W U E K I M V T W W A F I T O U A I T W S R
N L M P T X A L E P R K Y L H I O D N A L K U R D
W I K J G Y N V S B E L F C D G B X E A N Y B F P
W Z P G K L S I M Q B R Y U X B L M J V L A J L R
S B K X W B Y O V B G O B R H R D T C J U E N G S
W K Z U S S T W Z C S W B M J D D B V Y X C E W Y
F F N E U R O T R A N S M I T T E R Q W S O Q S B
J Y D I V I V V W S J T A P Q S C X D Y T H C V I
F F X T I N B I A O S M J A R X M Y X G H G A L E

endocannabinoid
endocannabinoid system
neuron
marijuana
cannabis
neurotransmitter
cellular receptor
enzymes
THC
medical
recreational
ask listen learn

To learn more about teaching units on the impacts of underage drinking and peer pressure, see additional lessons from *Ask, Listen, Learn*

See all lessons

ask listen learn™
Kids and alcohol don't mix.

For more info head to **AskListenLearn.org**

Brain WORD Scramble

How Marijuana affects the developing brain

1. danceonaionidnb
   _____

2. nnaaioddnoecnbi meysts
   _____ _____

3. eonunr
   _____

4. ajaaunrim
   _____

5. aacbinsn
   _____

6. atumnroetnsirert
   _____

7. ecarllul rtecpreo
   _____ _____

8. emzsnye
   _____

9. HTC
   ___

10. emldiac
    _____

11. arrtlaieeocn
    _____

12. sak eitsnl lraen
    ____ _____ _____

1. endocannabinoid 2. endocannabinoid system 3. neuron 4. marijuana 5. cannabis 6. neurotransmitter 7. cellular receptor 8. enzymes 9. THC 10. medical 11. recreational 12. ask listen learn

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STANDARDS ALIGNMENT

LESSON 8

Marijuana and Your Developing Brain

Content	Student Objectives	Classroom Activities	Assessment
• The function of the endocannabinoid system within the developing brain • How marijuana affects the endocannabinoid system • How marijuana use can affect health • How to practice healthy decision making	***Students will be able to:*** • Identify the three parts of the endocannabinoid system and understand its function • Communicate the way in which marijuana affects the endocannabinoid system • Understand the risks associated with youth marijuana use including addiction and mental health issues • Demonstrate the ability to make healthy decision	• Video and class discussion • Health discussion • Endocannabinoid Key-Coding Activity • Decision Making Activity	***Formative:*** • Written discussion questions • Classroom discussion • Vocabulary homework ***Formative/Summative:*** • Decision Making worksheet • Key Coding Activity

Standards

CCSS:

- RI.5-7.1
- RI.5-7.2
- RI.5-7.4
- RI.5-7.10
- RST.6-8.1
- RST.6-8.2
- RST.6-8.4
- RST.5-7.10
- W.5-7.10
- WHST.6-8.10
- L.5-7.1
- L.5-7.2
- L.5-7.4
- L.5-7.6
- SL.5-7.1

NHES 2024:

- 3.8.3
- 2.8.1
- 2.8.3
- 5.8.4

NGSS

- MS.LS1.2
- MS.LS1.3
- MS.LS1.8

For your next class...

How Alcohol Affects Your Developing Brain

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