

Module #1: The Changing Adolescent Brain and Technology

Primary understanding

Students will explore and evaluate information about adolescent brain development and how that affects the way adolescents use technology.

Module description

Students will explore the changes in their brains during the adolescent years. Focuses on how social relationships and sensitivity to reward make them uniquely vulnerable to the positive and negative effects of using technology.

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Module vocabulary

Neuron - cells of the nervous system, including the brain

Synapse - the space between two neurons, where neurons use chemical and electrical signals to communicate with each other

Synaptic pruning - the process of removing synapses, or brain connections

Myelin - a substance that wraps around part of the neuron to help neurons communicate more efficiently with each other

Myelination - the process of adding myelin to neurons

Striatum - a structure in the center of the brain that supports learning and responding to rewards. The striatum is divided into the ventral striatum, which includes the nucleus accumbens, and the dorsal striatum.

Reward processing - how the brain learns from reward. The striatum is one part of the brain used for reward processing.

Prefrontal Cortex (PFC) - the front part of the brain that supports many functions, including planning, self-control, and social processing

Module materials

[Lesson slides](#)

Internet-connected devices for students (alternative activities are suggested if such devices are not available for students in class)

[KWLH chart](#) (digital or physical copies)

[Hyperdoc](#) (digital link)

[Lesson 2 Review](#) (educators should create their own Google Form distribution links)

[Coloring worksheet](#) (physical copies)

[Technology Use Log](#) (digital or physical copies)

[Disconnect from Technology Challenge worksheet](#) (physical copies recommended)

Module standards

[CDC National Health Standards for Middle School](#)

- 1.8.1 Analyze the relationship between healthy behaviors and personal health.
- 1.8.2 Describe the interrelationships of emotional, intellectual, physical, and social health in adolescence.
- 1.8.8 Examine the likelihood of injury or illness if engaging in unhealthy behaviors.
- 2.8.6 Analyze the influence of technology on personal and family health.
- 5.8.1 Identify circumstances that can help or hinder healthy decision-making.

[Florida Health Education Standards for Middle School](#)

- HE.6 C.1.2, C.1.8, C.2.5, C.2.6
B.5.1, B.5.2, B.6.1, B.6.3
- HE.7 C.1.1, C.1.2, C.1.4, C.1.8
B.5.1, B.5.2, B.6.1, B.6.3
P.7.2

HE.8 C.1.2, C.1.4, C.1.8, C.2.6
B.5.1, B.5.2, B.6.1, B.6.3
P.7.2

Lesson #1: The changing adolescent brain

Essential question

What are the brain changes associated with adolescence?

Learning intention

Describe some of the physical, cognitive, emotional, social, and psychological changes in adolescence.

Lesson vocabulary

Neuron - cells of the nervous system, including the brain

Synapse - the space between two neurons, where neurons use chemical and electrical signals to communicate with each other

Synaptic pruning - the process of removing synapses, or brain connections

Myelin - a substance that wraps around part of the neuron to help neurons communicate more efficiently with each other

Myelination - the process of adding myelin to neurons

Lesson materials

[Lesson slides](#)

Internet-connected devices for students (alternative activities are suggested if such devices are not available for students in class)

[KWLH chart](#) (digital or physical copies)

[Hyperdoc](#) (digital link)

Lesson standards

[CDC National Health Standards for Middle School](#)

1.8.2 Describe the interrelationships of emotional, intellectual, physical, and social health in adolescence.

Florida Health Education Standards for Middle School

HE.6 C.1.2

HE.7 C.1.2

HE.8 C.1.2

Lesson plan

Introduction (~10 minutes)

Ask the students if they believe that the brain changes from childhood to adolescence to adulthood. What do they think makes their brain different from a young child's brain or an adult's brain?

Tell students to open the [KWLH chart](#) and complete the K & W portion of the chart.

Ask students to sort their ideas into the following categories:

- Physical
- Cognitive (how you gain knowledge or comprehend something)
- Emotional
- Social
- Psychological (affecting your mental or emotional state)

Turn and talk (~10 minutes)

Say: Turn and talk to your partner and make a list of changes you believe are taking place in your brain as an adolescent.

Call on pairs to share responses. Record answers on an anchor chart.

Hyperdoc (~20 minutes)

Say: Now that you have identified some changes you will now dive deeper into the topic by researching the adolescent brain using a [hyperdoc](#). You may add to or change your initial responses as you watch the video links in the hyperdoc.

If students do not have internet-connected devices to watch the videos on their own in class, they may watch them together as a class.

Vocabulary (~8 minutes)

[Neuron slide] Say: *Let's review some of the brain-related vocabulary from the hyperdoc videos. This is a neuron. It is a type of cell found in your brain. In this example neuron, the dendrites pick up a signal from the previous neuron [translucent portion of the image on top left] and send it down the axon to the next neuron [translucent portion of the image on the bottom right]. By sending signals between neurons, your brain can think, see, hear, feel, do, etc.*

[Synapse slide] Say: *You can't really see it in this illustration, but in your brain, there are actually tiny spaces, or gaps, between neurons. The space between neurons is called synapses [highlighted boxes], and neurons send chemical and electrical signals across the synapses to communicate with each other.*

[Synaptic pruning slide] Say: *As you learned in Dan Siegel's video from the hyperdoc, during adolescence, your brain prunes away, or gets rid of, the extra synapses that are no longer needed [highlighted box shows erased synapses]. This is called synaptic pruning. Scientists call this "Use it or lose it" because brain connections that are not used are lost to synaptic pruning.*

[Myelin slide] Say: *Another part of the neuron is myelin [light blue substance in highlighted box]. Myelin is a substance that wraps around the axon to help neurons communicate more efficiently with each other. This example neuron has myelin, but not all neurons do.*

[Myelination slide] Say: *As you also learned in Dan Siegel's video from the hyperdoc, during adolescence, your brain goes through extensive myelination or the process of adding myelin to neurons. This helps your brain become faster and more efficient at doing things.*

Wrap up/homework (~2 minutes)

Students will complete the L & H portion of the KWLH chart for homework and present during the next class meeting.

Lesson #2: The adolescent brain and reward

Essential question

What are the brain changes associated with adolescence? (continued)

Learning intention

Introduce reward processing in the brain.

Lesson vocabulary

Striatum - a structure in the center of the brain that supports learning and responding to rewards. The striatum is divided into the ventral striatum, which includes the nucleus accumbens, and the dorsal striatum.

Reward processing - how the brain learns from reward. The striatum is one part of the brain used for reward processing.

Prefrontal Cortex (PFC) - the front part of the brain that supports many functions, including planning, self-control, and social processing

Lesson materials

[Lesson slides](#)

Internet-connected devices for students (alternative activities are suggested if such devices are not available for students in class)

[KWLH chart](#) (completed from Lesson #1 homework)

[Lesson 2 Review](#) (educators should create their own Google Form distribution links)

[Coloring worksheet](#) (physical copies)

[Technology Use Log](#) (digital or physical copies)

Lesson standards

[CDC National Health Standards for Middle School](#)

- 1.8.2 Describe the interrelationships of emotional, intellectual, physical, and social health in adolescence.
- 2.8.6 Analyze the influence of technology on personal and family health.

[Florida Health Education Standards for Middle School](#)

- HE.6 C.1.2, C.2.5, C.2.6
B.6.1
- HE.7 C.1.2
B.6.1
- HE.8 C.1.2, C.2.6
B.6.1

Lesson plan

Share (~15 minutes)

Ask students to present their hyperdoc findings and have an open discussion about the KWLH charts that they completed for homework.

Review (~12 minutes)

Say: Let's review what you have learned about the adolescent brain. Complete the Google Form about what stuck with you from the previous lesson. After you have completed the Google Form, please work on the coloring worksheet.

If students do not have internet-connected devices to complete the Google Form review, it may be taken with the educator reading the questions out loud for students to answer on their own paper.

After students complete their worksheets, have them share with their neighbors and compare what they drew and labeled with the image on the slide.

Say: Remember that synapses allow neurons to communicate with each other. During adolescence, the synapses that aren't used enough are pruned away. Also, remember that adding myelin to a neuron helps it communicate more efficiently. During adolescence, neurons that are frequently used are myelinated, so they become more efficient. These two processes, synaptic pruning and myelination help make your adolescent brain more specialized and expert at what it does.

Watch and vocabulary (~5 minutes)

Say: Today we are going to explore how reward processing affects adolescents.

Play the video and review the vocabulary words on the subsequent slide.

Brainstorm (~15 minutes)

Say: Now that you have learned more about the adolescent brain, we are going to make a list of how reward applies to technology or social media.

Record and discuss answers in class. List may include responses such as viewing/posting/receiving likes on social media, kills/successes in video games, etc.

Ask students how the rewarding aspects of technology and social media may drive people, especially adolescents, to want to use technology or social media too much.

Wrap up/homework (~3 minutes)

Discuss the Technology Log. Explain that the students are challenged to record their technology use for 5 days [or however many days your schedule allows], documenting the date, the type of device they are using, the activity they are participating in, and the amount of time they are engaging with the device. At the end of the five days, they are to calculate the amount of time they spend using technology and answer some reflective questions.

Lesson #5, will serve as a reflective exercise to apply R.E.C.K strategies to lessen their engagement time.

Lesson #3: R.E.C.K. technology use

Essential question

What are the positive and negative ways that technology is used in the world?

Learning intention

Evaluate existing technology habits.

Lesson vocabulary

None

Lesson materials

[Lesson slides](#)

[Disconnect from Technology Challenge worksheet](#) (physical copies recommended for full technology disconnection)

Lesson standards

[CDC National Health Standards for Middle School](#)

- 1.8.1 Analyze the relationship between healthy behaviors and personal health.
- 1.8.8 Examine the likelihood of injury or illness if engaging in unhealthy behaviors.
- 2.8.6 Analyze the influence of technology on personal and family health.
- 5.8.1 Identify circumstances that can help or hinder healthy decision-making.

[Florida Health Education Standards for Middle School](#)

- HE.6 C.1.8, C.2.6
B.5.1, B.5.2, B.6.1, B.6.3

HE.7 C.1.1, C.1.4, C.1.8
B.5.1, B.5.2, B.6.3
P.7.2

HE.8 C.1.4, C.1.8, C.2.6
B.5.1, B.5.2, B.6.1, B.6.3
P.7.2

Lesson plan

Brainstorm (~15 minutes)

Say: We have learned so much about the adolescent brain and how it is developing, we have also learned about reward processing in your brain and how it is tied into technology use. Today we will explore the positive and negative uses of technology.

Have students break into groups to make lists of positive and negative uses for technology.

Share (~10 minutes)

Have students share their lists with the class by reporting out verbally or having students write their answers on a shared chart.

Ask students to discuss what distinguishes positive use from negative use.

R.E.C.K. (~15 minutes)

Say: As we learn about the positive and negative ways we use technology and how the adolescent brain works, we are going to focus on how you can take control of your media use.

Discuss the 4 steps of R.E.C.K. Encourage students to answer the questions and share feedback about each step.

Say: Today you will create an acronym to teach others about how to take control of their social media use.

Encourage students to be creative and share when done. (see examples on slide deck)

Homework (~10 minutes)

Say: Your homework is to take a 4-hour technology challenge. Choose a time when you would normally be using technology, and go without technology for at least 4 hours. This includes

disconnecting from your cell phone, computer, laptop, desktop, tablet, television/streaming, social media, etc. Record your experience on the Technology Challenge worksheet, and be prepared to share your experience with the class.

Take questions and clarify the assignment. Ask students how challenging they think this will be.

Lesson #4: R.E.C.K. technology use (continued)

Essential question

How does the changing adolescent brain affect adolescents' technology use?

Learning intention

Evaluate existing technology habits.

Lesson vocabulary

Neuron - cells of the nervous system, including the brain

Synapse - the space between two neurons, where neurons use chemical and electrical signals to communicate with each other

Synaptic pruning - the process of removing extra synapses, or brain connections, that are no longer needed

Myelin - a substance that wraps around part of the neuron to help neurons communicate more efficiently with each other

Myelination - the process of adding myelin to neurons

Lesson materials

[Lesson slides](#)

[Disconnect from Technology Challenge worksheet](#) (completed from Lesson #3 homework)

Lesson standards

[CDC National Health Standards for Middle School](#)

1.8.1 Analyze the relationship between healthy behaviors and personal health.

- 1.8.2 Describe the interrelationships of emotional, intellectual, physical, and social health in adolescence.
- 1.8.8 Examine the likelihood of injury or illness if engaging in unhealthy behaviors.
- 2.8.6 Analyze the influence of technology on personal and family health.
- 5.8.1 Identify circumstances that can help or hinder healthy decision-making.

Florida Health Education Standards for Middle School

- HE.6 C.1.2, C.1.8, C.2.5, C.2.6
B.5.1, B.5.2, B.6.1, B.6.3
- HE.7 C.1.1, C.1.2, C.1.4, C.1.8
B.5.1, B.5.2, B.6.1, B.6.3
P.7.2
- HE.8 C.1.2, C.1.4, C.1.8, C.2.6
B.5.1, B.5.2, B.6.1, B.6.3
P.7.2

Lesson plan

Watch and review (~5 minutes)

Say: *Let's review the many changes that take place in your adolescent brain.*

Vocabulary (~5 minutes)

Review the vocabulary words from the video/lesson #1

Brainstorm (~10 minutes)

Ask the students to relate their changing brains to their technology use.

Engage (~30 minutes)

Say: *Today we will review how your technology challenge went.*

Break students into groups to answer the following questions, then share out as a class:

- Were you able to complete the Disconnect from Technology Challenge?
- What was difficult about going without technology? Give examples.

- Describe any feelings you had when completing the challenge or what drove you to quit the challenge.
- Reflecting on the video, can you verbalize a connection between the adolescent brain and why you may have found it difficult to complete the 4-hour challenge?

Lesson #5: What did we learn about the adolescent brain and technology?

Essential question

What did we learn in this module?

Learning intention

Review and synthesize the lessons from this module.

Lesson vocabulary

None

Lesson materials

[Lesson slides](#)

[Technology Use Log](#) (completed from Lesson #2 homework)

Art supplies if students choose to make collages

Lesson standards

[CDC National Health Standards for Middle School](#)

- 1.8.1 Analyze the relationship between healthy behaviors and personal health.
- 1.8.2 Describe the interrelationships of emotional, intellectual, physical, and social health in adolescence.
- 1.8.8 Examine the likelihood of injury or illness if engaging in unhealthy behaviors.
- 2.8.6 Analyze the influence of technology on personal and family health.
- 5.8.1 Identify circumstances that can help or hinder healthy decision-making.

[Florida Health Education Standards for Middle School](#)

HE.6	C.1.2, C.1.8, C.2.5, C.2.6 B.5.1, B.5.2, B.6.1, B.6.3
HE.7	C.1.1, C.1.2, C.1.4, C.1.8 B.5.1, B.5.2, B.6.1, B.6.3 P.7.2
HE.8	C.1.2, C.1.4, C.1.8, C.2.6 B.5.1, B.5.2, B.6.1, B.6.3 P.7.2

Lesson plan

Share: Technology Use Log (~10 minutes)

Have students share their total technology use time over the time that they kept the log. Educators can create a Google Form for students to enter their times and generate a graph, use free polling software such as [Mentimeter](#) to display a graph, or draw a horizontal line on the board labeled with time amounts and have students draw a mark for their total time.

Ask students to reflect on their technology use and discuss how their brain development affects the ways in which they use technology.

R.E.C.K. review (~10 minutes)

Say: Let's review the steps of R.E.C.K. As we go through the steps, think about how they relate to what you learned about yourself from your Technology Use Log and the Disconnect from Technology Challenge. How can you apply these steps to change your technology use?

Encourage students to share at each step and/or at the end.

Show what you know (~30 minutes)

Ask students to create a one-page recap of what they learned from this module. The following information must be represented:

1. Three facts regarding the physical, cognitive, emotional, social, or psychological changes in adolescence.
2. An area of the brain where reward processing occurs.
3. An example of how reward processing drives technology use.
4. Two ways to self-monitor technology use.

Tell students that they will present their work at the end of class.