

# GRADE 7 Module 4

## UNIT 1

### Building Background Knowledge

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# I Notice/I Wonder Note-Catcher

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Notices	Wonders

My initial thoughts:

1. What do you think are some of the ideas that we will explore in this module?

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## 2 STUDENT JOURNAL • Grade 7 • Module 4 • Unit 1 • Lesson 1

2. Which Gallery Walk item made you most curious to learn more? Why?

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# Teens and Decision Making: What Brain Science Reveals

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Picture this: Your finger is poised on the *send* button, your eyes scanning an angry e-mail you've dashed off to a friend who has upset you. Some things you've written are a little harsh. In your brain a little red light goes off, but, what the heck, you're steamed and your friend deserves it. You push the button.

Whether you're aware or not, rushed decisions like this—acting before *thinking it through*—happen more often in teens than in adults. Recent discoveries in brain science may help explain why this is so.

First, a bit on how a brain makes decisions. Decisions don't "just happen" automatically in your conscious mind. They stem from a series of events in the brain, which happen almost instantaneously. This involves a relay system in which different structures—made up of specialized cells called neurons—talk with each other by way of electrochemical impulses and chemical messengers, called neurotransmitters. Information flowing through this decision-making circuit is analyzed in the different structures. Then the network, as a whole, puts out a response. This output provides the basis for our behaviors and actions.

While this process is basically the same for teens and adults, the devil is in the details. Since the brain is not fully developed until the early 20s, the way in which a teen's decision-making circuit integrates information may put him or her at a higher risk of making decisions the teen could later regret.

## The Teen Brain: Under Construction

Not long ago, scientists thought the human brain was fully mature long before the teen years. While research shows that one's brain reaches its maximum size between ages 12 and 14 (depending on whether you are a girl or boy), it also shows that brain development is far from complete. Regions of the brain continue to mature all the way through a person's early 20s.

A key brain region that matures late is the **prefrontal cortex**, located directly behind your forehead. The prefrontal cortex is very important as a control center for thinking ahead and sizing up risks and rewards. (This area is, in fact, the little red light that was trying to warn you about sending that e-mail.) Meanwhile, another part of the brain that matures earlier is the **limbic system**, which plays a central role in the emotional responses.

Since the limbic system matures earlier, it is more likely to gain an upper hand in decision making. This relationship between the emotional center (limbic system) and control center (prefrontal cortex) helps to explain a teen's inclination to rush decisions. In other words, when teens make choices in emotionally charged situations, those choices are often more weighted in *feelings* (the mature limbic system) over *logic* (the not-yet-mature prefrontal cortex).

This is also why teens are more likely to make "bad" choices, such as using drugs, alcohol, and tobacco—all of which pose a risk of serious health consequences. "Most kids don't really 'plan' to use drugs," says

Professor Laurence Steinberg of Temple University, “at least not the first time. They are more likely to experiment *on the spur of the moment*, particularly when influenced by others [peer pressure].”

## Fine-Tuning the Brain

Like the rest of the body, the brain needs to mature in order to reach peak performance. This process involves slow changes—strongly influenced by brain activity—that have evolved to fine tune (or optimize) how neural impulses flow throughout the brain, allowing it to process information faster and more reliably.

Inside the brain, information travels through a network of neurons, which have thread-like fibers called *axons* and branch-like structures called *dendrites*. Dendrites bring information into the neurons, while axons take it away and pass it along to the next neuron. Thus, neurons are assembled into circuits where the far end of an axon (its terminal) is positioned close to a dendrite. The small space between the two is called a **synapse**—where information is exchanged.

Throughout childhood and adolescence, the brain is busy fine-tuning itself through two key processes: myelination and synaptic pruning.

In **myelination**, axons wrap themselves in a fatty substance (myelin sheath), which works like the insulating plastic that surrounds electrical wires. This boosts the brain’s efficiency by increasing the speed with which a signal travels down the axon by up to 100 times. In **synaptic pruning**, synapses not used very often are removed, allowing the brain to redirect precious resources toward more active synapses. This strategic loss of weak synapses shapes the brain and makes it more efficient. This important pruning process molds the brain in response to a person’s experience and activities.

This means that teens have the potential, through their choices and the behaviors they engage in, to shape their own brain development—strengthening some circuits and getting rid of others. This makes the type of activities teens are involved in especially important. Skill-building activities, such as many physical, learning, and creative endeavors, not only provide stimulating challenges, but can simultaneously build strong brain pathways. When teens learn and repeat appropriate behaviors, they are helping to shape their brains—and their future.

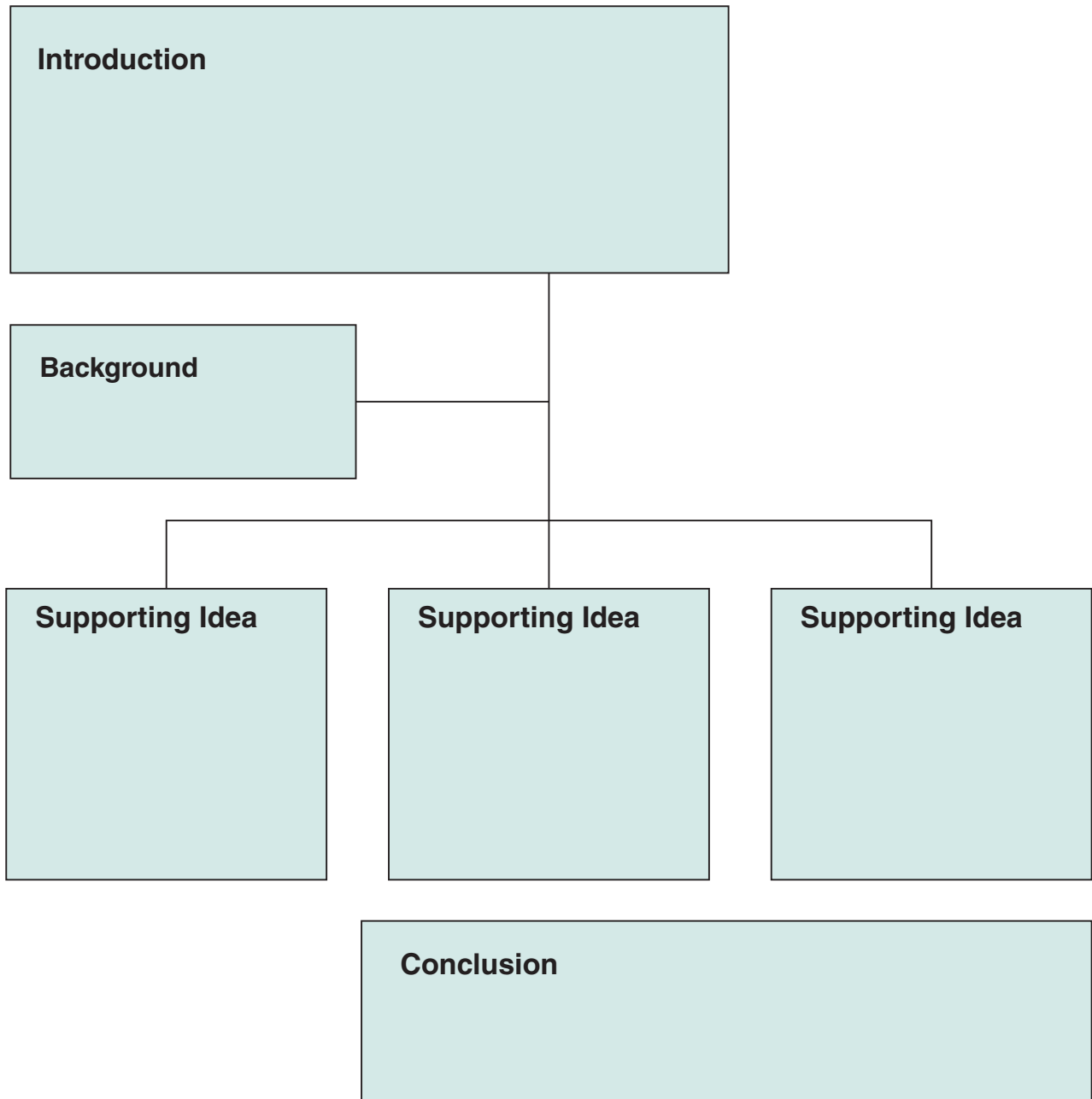
## Wait a Minute!

Learning how your brain works can help explain why sometimes you behave like you do. With this knowledge, you can be better equipped to make smart choices.

One tip to follow is to *take a moment* before acting. When making a decision, something as simple as stopping to think can mean the difference between a positive and negative outcome. By waiting a minute before acting, you allow yourself to:

- consider consequences;
- weigh harmful outcomes (e.g., harm to yourself or others) against short-term benefits (e.g., fitting in or feeling high);
- determine whether peer pressure is making you do something you’d otherwise not do;
- get information or advice, if you need it.

# Informational Text Structure Map



# Neurologist's Notebook 1

## "The Teen Brain: It's Just Not Grown Up Yet"

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Directions:** Use this note-catcher to get the gist of the reading. Remember that the main idea and supporting idea/details are often not just a single sentence of the text; rather, they may involve multiple sentences.

<b>Main idea:</b>	
<b>Brief background:</b>	<b>Supporting idea/detail:</b>
<b>Supporting idea/detail:</b>	<b>Supporting idea/detail:</b>
<b>Supporting idea/detail:</b>	<b>Supporting idea/detail:</b>

## Vocabulary

Word	Definition	Context clues: How did you figure out this word?
pediatric neurologist		
neuroscientists		
frontal lobes		
myelin or “white matter”		
neural insulation		
brain chemistry		
cognitive deficits		
cognitive baseline		



## Text and Questions

### “The Teen Brain: It’s Just Not Grown Up Yet”

**Directions:** Please read the article below. As you read, use the Informational Text Structure Map and the right-hand column of this handout to help guide your thinking. Read the entire article before you write anything in the neurologist’s notebook. Then go back and look at the gist notes you wrote here as you fill in the neurologist’s notebook entry.

<p>When adolescence hit Frances Jensen’s sons, she often found herself wondering, like all parents of teenagers, “What were you thinking?”</p> <p>“It’s a resounding mantra of parents and teachers,” says Jensen, who’s a pediatric neurologist at Children’s Hospital in Boston.</p> <p>Like when son number one, Andrew, turned 16, dyed his hair black with red stripes and went off to school wearing studded leather and platform shoes. And his grades went south.</p> <p>“I watched my child morph into another being, and yet I knew deep down inside it was the same Andrew,” Jensen says. Suddenly her own children seemed like an alien species.</p> <p>Jensen is a Harvard expert on epilepsy, not adolescent brain development. As she coped with her boys’ sour moods and their exasperating assumption that somebody else will pick up their dirty clothes, she decided to investigate what neuroscientists are discovering about teenagers’ brains that makes them behave that way.</p>	<p>This is the introduction. What is the anecdote that helps introduce this topic? Underline the sentence that helps you focus on the central idea.</p> <p><i>Hint:</i> Wait to write the central idea on the neurologist’s notebook until you have read the whole article once.</p>
<p><b>Teenage Brains Are Different</b></p> <p>She learned that it’s not so much what teens are thinking—it’s how.</p> <p>Jensen says scientists used to think human brain development was pretty complete by age 10. Or as she puts it, that “a teenage brain is just an adult brain with fewer miles on it.”</p>	<p>Here is the background information that the reader needs.</p> <p>Take gist notes here.</p>

<p>But it's not. To begin with, she says, a crucial part of the brain—the frontal lobes—are not fully connected. Really. "It's the part of the brain that says: 'Is this a good idea? What is the consequence of this action?'" Jensen says. "It's not that they don't have a frontal lobe. And they can use it. But they're going to access it more slowly. "That's because the nerve cells that connect teenagers' frontal lobes with the rest of their brains are sluggish. Teenagers don't have as much of the fatty coating called myelin, or 'white matter,' that adults have in this area. "Think of it as insulation on an electrical wire. Nerves need myelin for nerve signals to flow freely. Spotty or thin myelin leads to inefficient communication between one part of the brain and another."</p>	
<p><b>A Partially Connected Frontal Lobe</b></p> <p>Jensen thinks this explains what was going on inside the brain of her younger son, Will, when he turned 16. Like Andrew, he'd been a good student, a straight arrow, with good grades and high SAT scores. But one morning on the way to school, he turned left in front of an oncoming vehicle. He and the other driver were OK, but there was serious damage to the car.</p> <p>"It was, uh, totaled," Will says. "Down and out. And it was about 10 minutes before morning assembly. So most of the school passed by my wrecked car with me standing next to it."</p> <p>"And lo and behold," his mother adds, "who was the other driver? It was a 21-year-old—also probably not with a completely connected frontal lobe." Recent studies show that neural insulation isn't complete until the mid-20s.</p> <p>This also may explain why teenagers often seem so maddeningly self-centered. "You think of them as these surly, rude, selfish people," Jensen says. "Well, actually, that's the developmental stage they're at. They aren't yet at that place where they're thinking about—or capable, necessarily, of thinking about the effects of their behavior on other people. That requires insight. "And insight requires—that's right—a fully connected frontal lobe."</p>	<p>From this heading, you know that this section will focus on supporting details about the frontal lobe (this includes the prefrontal cortex). Take gist notes about what you learn.</p>

### **More Vulnerable to Addiction**

But that's not the only big difference in teenagers' brains. Nature made the brains of children and adolescents excitable. Their brain chemistry is tuned to be responsive to everything in their environment. After all, that's what makes kids learn so easily.

But this can work in ways that are not so good. Take alcohol, for example. Or nicotine, cannabis, cocaine, ecstasy . . .

"Addiction has been shown to be essentially a form of 'learning,'" Jensen says. After all, if the brain is wired to form new connections in response to the environment, and potent psychoactive drugs suddenly enter that environment, those substances are "tapping into a much more robust habit-forming ability that adolescents have, compared to adults."

So studies have shown that a teenager who smokes pot will still show cognitive deficits days later. An adult who smokes the same dose will return to cognitive baseline much faster.

This bit of knowledge came in handy in Jensen's own household.

"Most parents, they'll say, 'Don't drink, don't do drugs,'" says Will, son number two. "And I'm the type of kid who'd say, 'Why?'"

When Will asked why, his mom could give him chapter and verse on drugs and teen brains. "So they would know," she says, "that if I smoke pot tonight and I have an exam in two days' time, I'm going to do worse. It's a fact."

"There were other advantages to having a neuroscientist mom," Will says. Like when he was tempted to pull an all-nighter.

Look at the heading. This is the focus of this section. Take gist notes about what in the teen brain makes it vulnerable to addiction.

Ask yourself: How do the supporting details in this section relate to the central idea?

“She would say, ‘Read it tonight and then go to sleep,’” he says. “And what she explained to me is that it will take [what you’ve been reading] from your short-term memory and while you sleep you will consolidate it. And actually you will know it better in the morning than right before you went to sleep.”

It worked every time, he says.

It also worked for Andrew, the former Goth. He’s now a senior at Wesleyan University, majoring in physics.

“I think she’s great! I would not be where I am without her in my life!” Andrew says of his mom.

For any parent who has survived teenagers, there are no sweeter words.

*Source:* “The Teen Brain: It’s Just Not Grown Up Yet” by Richard Knox. NPR news report excerpt was originally published on NPR.org on March 1, 2010. Used with the permission of NPR. © 2010 National Public Radio, Inc. Any unauthorized duplication is strictly prohibited.

Now that you have read and thought about the article, go back and ask yourself:

- If I had to describe this article in one sentence, what would I say?
  - Write that main idea in the box in neurologist’s notebook 1.
- What was the basic background information, summed up in one or two sentences?
  - Write that in the brief background box in neurologist’s notebook 1.
- As you fill in the **supporting idea/detail** boxes in neurologist’s notebook 1, ask yourself:
  - What about the partially connected frontal lobe was important? How might that relate to the main idea?
  - What else about the teen brain makes it different from an adult’s? Why is this important to the main idea?
  - How do the examples from the Jensen family’s life fit into the main idea?

# Thinking Log

## Unit 1

Name: \_\_\_\_\_

Date: \_\_\_\_\_

The Thinking Log is a place for you to track and reflect on your understanding of the neurological development of teens. Each entry in your Thinking Log will ask you to explain your current understanding of this issue.

### **Lesson 2: “The Teen Brain: It’s Just Not Grown Up Yet” by Richard Knox**

The main idea of last night’s reading was that knowing how the brain works was helpful to Dr. Jensen and her sons. How was it helpful to them? How do you think knowing something about how the adolescent brain works would be helpful to you? To your parents? To your school?

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What else are you wondering about the development of the adolescent brain?

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**Lesson 4: Entry Task: “What You Should Know about Your Brain”**

Dr. Willis says that when you stimulate neuron pathways over and over again, they become stronger. As she says, “Practice makes permanent.” What implications does this have for the kinds of activities that teens do repeatedly?

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What else are you wondering about the adolescent brain’s development?

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#### **Lesson 4: Exit Ticket: “Insight into the Teenage Brain”**

What did Dr. Galván’s experiments prove about how teens react differently to dopamine levels than adults and children? How might this explain teen behavior?

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What else are you wondering about the adolescent brain’s development?

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## Lesson 7

How has revisiting the resources in the Gallery Walk clarified your thinking about adolescent brain development?

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Reread what you wrote in Lesson 4. How might Dr. Galván's findings relate to the popularity of video games with teenagers specifically?

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## Lesson 8

In “Attention Economy,” Dr. Giedd implies that “real-life” activities like traditional homework, talking with friends, and working toward a long-term goal usually don’t provide the same jolt of dopamine of media devices. Why might that be a problem for students?

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What else are you wondering about adolescent brain development?

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## Lesson 10

How did today's reading help clarify your thinking about the issue of the teen brain and screen time?

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What else are you wondering about adolescent brain development?

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## Unit 2

### Lesson 3

How did today's reading help clarify your thinking about the issue of the teen brain and screen time?

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What else are you wondering about adolescent brain development?

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## Lesson 4

What role do video games play in your life? How often do you play them? With whom? What in your view are the benefits of playing video games?

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What else are you wondering about adolescent brain development?

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## Lesson 11

How did today's reading and video help clarify your thinking about adolescents and screen time?

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What else are you wondering about adolescent brain development?

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## Lesson 15

What have you found most personally interesting about the risks and benefits of screen time? Why?

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## Lesson 17

How did the Fishbowls clarify your thinking about entertainment screen time and adolescent neurological development?

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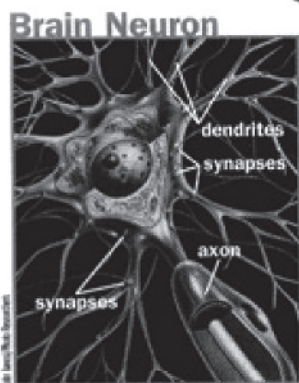
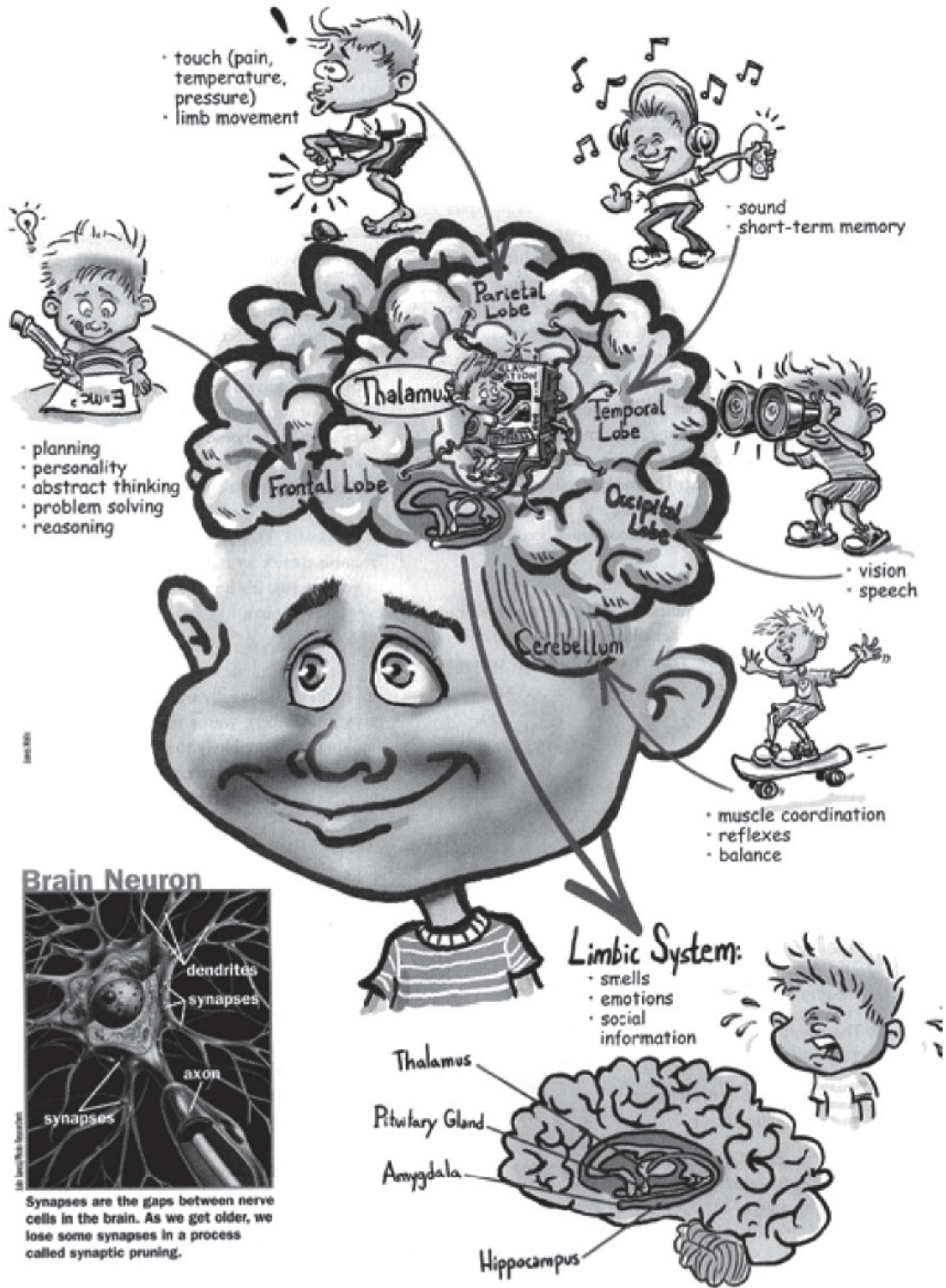
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# Brain Development Anchor Chart

Other Developmental Information	Prefrontal Cortex	Neurons	Limbic System	So What?



# What's Going On in Your Brain?



Synapses are the gaps between nerve cells in the brain. As we get older, we lose some synapses in a process called synaptic pruning.

Source: "What's Going On in Your Brain?" by Linda Bernstein from *Current Health 2*, February 2006. Copyright © 2006 by The Weekly Reader Corporation. Reprinted by permission of Scholastic Inc.

Here's a good comeback the next time an adult complains you're taking too many risks. Just say, "My brain made me do it."

Of course, in the real world, you can't use that excuse to cover reckless behavior. However, it's true that "the brain's inclination for sensation seeking becomes more intense during adolescence," Laurence Steinberg, a professor of psychology at Temple University and an expert on the teenage brain, told *Current Health 2*. At the same time, the brain mechanisms that regulate these desires are not yet fully developed. That's why teens want to do things like bungee jump or drive fast but often don't experience the fear or anxiety adults often associate with such risky activities.

## Picture This

Your brain is a mass of cells contained inside your skull. It is, in fact, the boss of you. As the diagram shows, there are many parts to the brain, and each has a different function—bossy functions. In fact, the brain is the only organ that has *localization*, explains Dr. Nancy L. Kuntz, a consultant in child and adolescent neurology at the Mayo Clinic in Rochester, Minnesota; one specific part controls movement, another helps decode vision, and so on.

Especially important to the teen brain are synaptic pruning and myelin. In childhood, the brain produces many *synapses*—gaps between nerve cells connected by electrical impulses called *neurotransmitters*. As you grow, the brain starts to shed some of those synapses because you don't need them. As Steinberg explains, "The brain starts out like a road map with dirt roads. Those synapses that you need turn into highways, and those not used disappear." That process is *synaptic pruning*.

Pruning is a good thing because the synapses you use get stronger and work better. For instance, during adolescence, as some synapses drop away and others take hold, your thinking becomes clearer and more mature. You get better at planning and controlling impulses.

Everyone has about 99 percent of the same synapses, but that still leaves billions that can differ from one person to another, Steinberg says. For instance, if you play guitar every day, your brain will have more fine-motor synapses than if you spend a lot of time listening to Fall Out Boy on your MP3 player. (In this case, audio synapses would rule.) The cool thing, says Steinberg, is that brain cells can actually regenerate, so synapses that have been pruned can be re-formed if your life direction or interests change. Synaptic pruning peaks at about age 12 or 13 but continues until you're about 24. So right now your brain chemistry is pretty active, preparing you to become an adult.

The production of *myelin*—the white matter that insulates the neurons—is as important as synaptic pruning. The amount of myelin in your brain increases during adolescence, according to Steinberg. The more myelin, the faster information is transmitted and the more adept, efficient, and mature your brain becomes.

## Get Touchy-Feely

Amid this molecular stuff, the teenage brain is witnessing other changes. Deep inside the brain, the *limbic system* controls smell perceptions and emotions, and processes social information, Steinberg says, and is one of the first to fully develop. Thus, a teen experiences feelings more intensely than he or she did as a child and learns how to control emotions. Notice that you no longer have tantrums when your mom won't buy you candy, but if a friend snubs you, you feel hurt, which when you were 6, you might not have noticed.

Strangely, says Steinberg, a teen's *prefrontal cortex*—the brain's smart part—is out of sync with limbic growth. That's why you may do things that you know aren't really good for you (such as coming home past curfew or eating a whole bag of potato chips all at once) while feeling that you just couldn't help doing it.

## Maintain Your Brain

Because there's so much going on right now in your brain, it's important to give it whatever help you can.

- Stay away from harmful substances, such as illegal drugs, alcohol, and nicotine. They can harm sensitive cells and undermine natural growth. Steinberg warns that teens who start smoking are more likely to develop a life habit than those who start later, probably because of the synaptic pruning taking place.
- Wear a helmet when you bike, skateboard, or ski, and wear seat belts in cars. A blow to the head, says Kuntz, may be a blow to the brain. So don't take chances.
- Exercise your mind. Do puzzles, read, think about the world or your life—such activities develop synapses you need and prune away those you don't, Steinberg says.
- Get a lot of sleep. Rest is important to the brain. While you snooze, your brain solidifies all the information it took in during the day, Steinberg says.

By now, having read this article, you might feel a little pumped because absorbing all this information has revved up your mind! Brain work is good for you, and it goes on every minute of every day, whether you think about it or not.

# Neurologist's Notebook 2

## "What's Going On in Your Brain?"

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Directions:** Use this note-catcher to get the gist of the reading. Remember that the main idea and supporting details are often not just a single sentence of the text; rather, they may involve multiple sentences.

<b>Main idea:</b>	
<b>Brief background:</b>	<b>Supporting idea/detail:</b>
<b>Supporting idea/detail:</b>	<b>Supporting idea/detail:</b>
<b>Supporting idea/detail:</b>	<b>Supporting idea/detail:</b>

## Vocabulary

Word	Definition	Context clues: How did you figure out this word?
reckless		
localization		
regenerate		
solidifies		

# Entry Task

## Self-Assessment

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Directions:** Please complete this task individually. Read through the two models for neurologist’s notebook 2. Then answer the questions that follow the models.

Version 1		Version 2	
<p><b>Main idea:</b> Your brain is still developing. This means that your actions can influence your development, and your actions are influenced by your forming brain.</p>		<p><b>Main idea:</b> Your brain is like a map. Through synaptic pruning, some roads are turning into highways and others are disappearing.</p>	
<p><b>Brief background:</b> The brain is a mass of cells, and each part serves a different function. Your brain grows synapses in childhood.</p>	<p><b>Supporting detail:</b> During the teen years, your brain is synaptic pruning—getting rid of the ones you don’t need based on what you are using them for.</p>	<p><b>Brief background:</b> The brain is a mass of cells, and it is the boss of you.</p>	<p><b>Supporting detail:</b> Teens want to do things like bungee jump.</p>
<p><b>Supporting detail:</b> Pruning is good because it helps the synapses that are left be more efficient. Myelin wraps the ones that are not pruned.</p>	<p><b>Supporting detail:</b> Even if synapses are pruned, they are not gone forever because they can regrow if you need them.</p>	<p><b>Supporting detail:</b> If you play guitar, your fine-motor synapses will grow.</p>	<p><b>Supporting detail:</b> Everyone has about 99 percent of the same synapses.</p>
<p><b>Supporting detail:</b> The limbic system is one of the first to fully develop and is out of sync with the prefrontal cortex.</p>	<p><b>Supporting detail:</b> You should do things to take care of your brain, like exercising, getting enough sleep, and avoiding harmful substances.</p>	<p><b>Supporting detail:</b> Synaptic pruning peaks at about age 12 or 13, but continues until age 24.</p>	<p><b>Supporting detail:</b> The limbic system is out of sync with the prefrontal cortex.</p>

Version 1		Version 2	
Therefore, a teen can control her or his emotions more and feel things more deeply, but sometimes makes poor decisions because the teen “felt” like it.			

Which version is more successful at capturing the main idea and supporting details? Why?

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Which entry is most similar to yours? Why?

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What did you struggle with in last night’s reading? How can I help you be more successful?

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# Neurologist's Notebook 3

## "Teens and Decision Making"

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Directions:** Use this note-catcher to get the gist of the reading. Remember that the main idea and supporting details are often not just a single sentence of the text; rather, they may involve multiple sentences.

<b>Main idea:</b>	
<b>Brief background:</b>	<b>Supporting idea/detail:</b>
<b>Supporting idea/detail:</b>	<b>Supporting idea/detail:</b>
<b>Supporting idea/detail:</b>	<b>Supporting idea/detail:</b>



# “The Child’s Developing Brain”

## Comparing Text to Multimedia

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**Directions:** Please read these excerpts from “The Child’s Developing Brain,” an interactive feature published by the *New York Times* on September 15, 2008. Then answer the questions.

### Overview:

Different areas of the brain mature at different rates, which helps explain many of the intellectual and emotional changes seen in children, teens, and young adults. While no two children develop in exactly the same way, scientists have been able to link certain developmental milestones to changes in brain tissue, observed by MRI scans taken repeatedly over years.

### 6 Years Old

#### REASON

The dappled yellow and the red areas of the prefrontal cortex indicate this part of the brain, which affects abstract thinking, reasoning skills and emotional maturity, has yet to develop. This lack of maturity is one reason young children can’t juggle a lot of information and throw tantrums when presented with too many choices.

### 13 Years Old

#### JUDGMENT

The prefrontal cortex is among the last areas to mature. Until it does, children lack the ability to adequately judge risk and make long-term plans. Ask kids at this age what they want to be when they grow up and the answer is likely to change often.

#### EMOTION

Deep in the limbic system, a capacity for creating emotion increases. As yet, this capacity is unrestrained by the prefrontal cortex, which lags behind. That’s why some teens can seem emotionally out of control.

### 17 Years Old

#### ABSTRACT THOUGHT

The deep blue and purple of the maturing prefrontal cortex shows why the brains of older teenagers are capable of dealing with far more complexity than younger children. This development leads to a burst of the social interactions and emotions among older teens. Planning, risk-taking, and self-control become possible.

1. What do these readings teach us about the prefrontal cortex and its link to developmental milestones?
2. Reread the overview. Why do you think the authors included the statement that “no two children develop in exactly the same way” before giving this information?

Now look at the interactive feature that accompanies this text.

3. What is different between the text and the interactive feature? How are they the same?
4. What are the advantages of the text-only version?
5. What are the advantages of the interactive version?

6. Reread what you wrote for question 1. How is your understanding different after seeing the interactive feature?

7. What other image might the authors have used?

# What You Should Know about Your Brain

Source: “What You Should Know about Your Brain” by Judy Willis from *Educational Leadership*. (2009): 1–3. Reprinted with permission from ASCD.

Although the brain is an amazing organ, it’s not equipped to process the billions of bits of information that bombard it every second. Filters in your brain protect it from becoming overloaded. These filters control the information flow so that only approximately 2,000 bits of information per second enter the brain.

## The Thinking Brain and the Reactive Brain

Once sensory information enters the brain, it’s routed to one of two areas: (1) The *prefrontal cortex*, what we might call the thinking brain, which can consciously process and reflect on information; or (2) the lower, automatic brain, what we might call reactive brain, which reacts to information instinctively rather than through thinking. The prefrontal cortex is actually only 17 percent of your brain; the rest makes up the reactive brain.

When you are not stressed by negative emotions, you can control what information makes it into your brain. By calming your brain, you can control which sensory data from your environment your brain lets in or keeps out—and influence which information gets admitted to your prefrontal cortex.

When your stress levels are down and your interest is high, the most valuable information tends to pass into your thinking brain. When you are anxious, sad, frustrated, or bored, brain filters conduct sensory information from the world around you into your reactive brain. These reactive brain systems do one of three things with the information: ignore it; fight against it as a negative experience (sending signals that may cause you to act inappropriately); or avoid it (causing you to daydream). If information gets routed to this reactive brain, it’s unlikely your brain will truly process the information or remember it.

Three major brain elements help control what information your brain takes in: the reticular activating system, the limbic system, and the transmitter dopamine. Let’s look at how you can help each one work in your favor.

## RAS: The Gatekeeper

The first filter that data passes through when entering your brain is the reticular activating system (RAS). Located at the lower back of your brain (your brain stem), the RAS receives input from sensory nerves that come from nerve endings in your eyes, ears, mouth, face, skin, muscles, and internal organs and meet at the top of your spinal cord. These sensory messages must pass through the RAS to gain entry to your higher, thinking brain.

You will learn more successfully if you keep the RAS filter open to the flow of information you want to enter your prefrontal cortex. If you build your power to focus your attention on the sensory input that is most valuable and important to attend to at the moment, the important input will make it into your

thinking brain. If you feel overwhelmed, your reactive brain will take over. Then, what you experience, focus on, and remember will no longer be in your control. It's the difference between *reflecting on* and *reacting to* your world.

### What You Can Do

A key to making your brain work optimally, then, is to keep yourself physically healthy and well rested and to develop awareness of—and some control over—your emotions. Then you can approach learning calmly and with positive emotions.

Practice focusing and observing yourself, for example, by taking a short break from work to check in with your emotions. Just take a few minutes to think about what you're feeling. If it's a good feeling, take time to enjoy it and consider how your good emotional state affects your thinking. Do you understand more and get ideas about what you might do with the information you're learning? If you don't like the way you're feeling, think about times you've felt a similar negative emotion (like anxiety or loneliness). What has helped you return to a better mood in the past?

Even though you're not sleeping, you can think of such brain breaks as “syn-naps” because they let your brain replenish neurotransmitters like dopamine (which we'll discuss shortly). As you become aware of your emotions, you build brain networks that help you control your actions with your thinking brain. It also helps to do something active during a short break—such as toss a ball back and forth with a classmate, saying a word related to your lesson each time you catch the ball.

## The Limbic System: Your Emotional Core

After the information coming in through your senses gets through the RAS, it travels to the sensory intake centers of your brain. New information that becomes memory is eventually stored in the *sensory cortex areas* located in brain lobes that are each specialized to analyze data from one of your five senses. These data must first pass through your brain's emotional core, the *limbic system*, where your *amygdala* and *hippocampus* evaluate whether this information is useful because it will help you physically survive or bring you pleasure.

### The Amygdala

The amygdala is like a central train-routing station: it's a system for routing information based on your emotional state. When you experience negative emotions like fear, anxiety, or even boredom, your amygdala's filter takes up excessive amounts of your brain's available nutrients and oxygen. This puts your brain into survival mode, which blocks entry of any new information into your prefrontal cortex.

For example, suppose your day starts off badly. You overslept, had no time for breakfast, and have too many things to do before school. You're worried about whether your friends will sit with you at lunch and afraid that the mean kid in your class will say hurtful things to you.

It's not only your body that suffers on this kind of day: Your brain is also stressed. This stress closes off the pathways through the RAS and amygdala that direct information into your thinking brain and memory centers. Unless you restore a positive mood, you won't learn much on this particular school

day. But if you can turn things around to become calm and focused, your amygdala will “decide” to send new information to your prefrontal cortex.

### **What You Can Do**

Slow down and take a moment to reflect instead of react when you take a test at school or face social conflicts with friends. You might take a deep breath and visualize yourself in a peaceful place. Another technique that helps you choose what to do with your emotions—something only humans can do—is to imagine you’re directing yourself in a play. You are the director sitting in a balcony seat watching an actor (the emotional you) on stage below. What advice would you give the emotion-filled actor on stage if he or she had been pushed by a classmate and wanted to hit back, for example? This technique helps you move away from using your reactive brain and tap your thinking brain, where memories that might help you are stored.

Your teachers play a role too. If your teachers set up lessons to include some fun activities so that you feel good during a lesson, your amygdala will add a neurochemical enhancement, like a memory chip, that strengthens the staying power of any information presented in the lesson. People actually remember more of what they hear and read if they are in a positive emotional state when they hear or read it.

### **The Hippocampus**

Next to the amygdala is the hippocampus. Here, your brain links new sensory input to both memories of your past and knowledge already stored in your long-term memory to make new *relational memories*. These new memories are now ready for processing in your prefrontal cortex.

Your prefrontal cortex contains highly developed nerve communication networks that process new information through what are called *executive functions*, including judgment, analysis, organizing, problem solving, planning, and creativity. The executive function networks can convert short-term relational memories into long-term memories. When you are focused and in a positive or controlled emotional state, your executive functions can more successfully organize newly coded memories into long-term knowledge.

### **What You Can Do**

Reviewing and practicing something you’ve learned helps. Nerve cells (neurons) forge information into memories by sending messages to other neurons through branches—called axons and dendrites—that almost touch the branches of each neighboring neuron. It takes lots of connections between neurons to relate each neuron’s tiny bit of information to that of other neurons so that all the bits add up to a complete memory. When you review or practice something you’ve learned, dendrites actually grow between nerve cells in the network that holds that memory.

Each time you review that knowledge, this mental manipulation increases activity along the connections between nerve cells. Repeated stimulation—for example, studying the times tables many times—makes the network stronger, just like muscles become stronger when you exercise them. And that makes the memory stay in your brain. Practice makes permanent.

When you review new learning through actions, using the knowledge to create something, solve problems, or apply it to another subject (such as using the times tables to measure the areas of paintings for framing them), this mental manipulation strengthens the neural pathways and your brain becomes even more efficiently wired.

## Dopamine: Feeling Good Helps You Learn

Dopamine is one of the brain's most important *neurotransmitters*. Messages connected to new information travel from neuron to neuron as tiny electrical currents. Like electricity, these messages need wiring to carry them. But there are gaps, called *synapses*, between the branches that connect nerve cells and there's no wiring at these gaps. Chemical neurotransmitters like dopamine carry electrical messages across the gap from one neuron to another. This transmission is crucial to your brain's capacity to process new information.

Your brain releases extra dopamine when an experience is enjoyable. As positive emotions cause dopamine to travel to more parts of your brain, additional neurons are activated. Thus a boost in dopamine not only increases your own sense of pleasure but also increases other neurotransmitters, such as acetylcholine, that enhance alertness, memory, and executive functions in the prefrontal cortex.

### What You Can Do

Certain activities, such as interacting with friends, laughing, physical activity, listening to someone read to you, and acting kindly increase dopamine levels. You'll boost your learning if you get them into your day.

Experiencing pride at accomplishing something is also correlated with higher dopamine. It will increase your learning power if you pursue activities that give you a sense of accomplishment. Think about your personal strengths, such as artistic ability, leadership, helping classmates resolve conflicts, athletic skills, or even qualities like optimism, kindness, and empathy. Use these skills to do projects you want to do—and do them well—and you'll find you can use your brain power more successfully to make judgments and solve problems.

You now have the power tool to achieve the goals you choose. Congratulations on the dendrites you've grown along the way!

# Neurologist's Notebook 4

## "Dopamine: Feeling Good Helps You Learn"

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Directions:** Use this note-catcher to get the gist of the reading. Remember that the main idea and supporting details are often not just a single sentence of the text; rather, they may involve multiple sentences.

<b>Main idea:</b>	
<b>Brief background:</b>	<b>Supporting idea/detail:</b>
<b>Supporting idea/detail:</b>	<b>Supporting idea/detail:</b>
<b>Supporting idea/detail:</b>	<b>Supporting idea/detail:</b>



# Analyzing the Main Idea and Supporting Details in Video Note-Catcher

<b>Title:</b> Insight into the Teen Brain	<b>Author/Presenter:</b> Dr. Adriana Galván	
<b>Main idea:</b>		
<b>Background or context:</b>		<b>Supporting idea/detail:</b>
<b>Supporting idea/detail:</b>	<b>Supporting idea/detail:</b>	<b>Supporting idea/detail:</b>
<b>Conclusion:</b> (So what does this all mean?)		

# Homework

## Summarizing the Main Idea and Supporting Details

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Directions:** Read the model below. Choose one of the articles from this unit. Reread it. Then, using the neurologist’s notebook entry you completed for that text as a guide, write a one-paragraph summary of one of the articles we have read.

Model Text	
<p>In her TEDx Talk titled “Insight into the Teenage Brain,” Dr. Galván explores what drives teens to make decisions. She explains that, through a series of experiments, researchers found that adolescents react differently to rewarding situations than adults. They have a much stronger reaction, and their brain activity goes “crazy.” According to Galván, this means that teens are more sensitive to novel or rewarding situations and that their brains are biased toward seeking these experiences. She points out that this is a good thing for adolescents because they need to break away from adults and seek new things. Their brains, which seek risks and rewards, will help them decide how to do that.</p>	<p>Notice that the first sentence identifies the title, the author, and a very general main idea. Then the author sums up the major supporting ideas.</p>
<p>My summary of _____ (anything but the TEDx Talk)</p>	<p>Helpful sentence stems:</p>
	<p>(Author) + explains, states, points out, reports, says + (information)</p>
	<p>According to + (author) + (information) This means that . . .</p>

# Analyzing the Main Idea and Supporting Details

## Partner Practice

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Directions:** With a partner, identify the main idea and supporting details of the first video clip.

<b>Name of the Video:</b> Development of the Young Brain, 00:00–1:30	
<b>Author or Presenter:</b> Jay Giedd, MD	
<b>Speaker's main idea:</b>	
<b>Supporting idea/detail:</b>	<b>Supporting idea/detail:</b>
<b>Supporting idea/detail:</b>	<b>Supporting idea/detail:</b>
<b>Supporting idea/detail:</b>	<b>Supporting idea/detail:</b>

1. What are two ways the brain of a teenager develops differently from the brain of a younger child?  
(LAFS.7.SL.1.2)

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2. According to Dr. Giedd, what determines which synapses (or brain connections) are reinforced and which are pruned? (LAFS.7.SL.1.2)

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3. How could the video have explained and/or shown Dr. Giedd's "gardening metaphor" ("The brain can grow extra connections, sorta like branches, twigs, and roots, to use a gardening metaphor") to make what he is saying easier to understand? (LAFS.7.RI.3.7)

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# Mid-Unit Assessment

## Analyzing “Development of the Young Brain”

Name: \_\_\_\_\_

Date: \_\_\_\_\_

### Part 1: My Current Thinking

What are the ways that the teen brain is growing and changing?

### Part 2: Informational Video Clip

**Directions:** Watch the second clip of the video carefully. Then fill in the chart below. You will watch the clip twice. (LAFS.7.SL.1.2)

<b>Name of the Video:</b> Development of the Young Brain, 1:30–3:34	
<b>Author or Presenter:</b> Jay Giedd, MD	
<b>Speaker’s main idea</b>	
<b>Supporting idea/detail:</b>	<b>Supporting idea/detail:</b>

<b>Supporting idea/detail:</b>	<b>Supporting idea/detail:</b>
<b>Supporting idea/detail:</b>	

## Part 3: Multiple Choice

**Directions:** Please read the following questions and choose the best answer for each.

1. Why does Dr. Giedd cite the statistic that an average adolescent spends about 11.5 hours on some type of media per day and that that's up from 6.5 hours just five years ago? (LAFS.7.SL.1.2)
  - A. To prove that children waste a lot of time on media devices
  - B. To illustrate his point that the activities of children have changed rapidly in recent years
  - C. To prove that more experiments are needed to see what happens when we multitask
  - D. To illustrate that kids spend a lot of time on media
2. Why does Dr. Giedd compare reading to the new flood of information that a child's brain must process today? (LAFS.7.SL.1.2)
  - A. To prove that just as the human brain adapted to reading, the brain may be able to adapt to the new information
  - B. To prove that children are reading less, and that's a problem
  - C. To prove that if a child can learn to read, a child can handle all the new information easily
  - D. To prove that human beings are used to reading information
3. Which of these questions did Dr. Giedd NOT raise in this section? (LAFS.7.SL.1.2)
  - A. What's the impact of technology on the brain? For good and for bad?
  - B. Will the brain of a "digital native" be different from that of an older person?
  - C. What are the limitations of the brain's ability to adapt?
  - D. What makes the brain "prune" or "branch"?

## Part 4: Comparing Text to Video

**Clip:** 3:34–4:50

**Directions:** Please read the transcript of the clip below. Then wait for the teacher to play the video. After viewing the video, answer the questions.

Announcer: So, what was the human brain originally developed to do? Well, Dr. Giedd says our brains are fundamentally designed to learn through example.

Giedd: This learning by example is very powerful and that parents are teaching even when they don't realize they're teaching, just by how they handle everyday aspects of their life. How they treat each other as spouses. How they talk about work. When they get stuck in traffic. How they manage their time and their emotions. And this is how most of the teaching is done. It's not when you sit down at these special moments and have a conversation. It's the everyday moments that really have a huge impact on how the brain forms and adapts.

Announcer: Through the work of Dr. Giedd and his colleagues, we've learned so much about the development of the adolescent brain. But researchers like Dr. Giedd may be entering a new golden age of research as these so-called digital natives lead us to new findings in the ever-evolving childhood brain.

1. How was watching the video different from reading the text?

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2. Were the video's images effective? Why or why not?

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3. What other images might reinforce the content of this video?

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# Excerpt 1 of “The Digital Revolution and Adolescent Brain Evolution”

**Directions:** Please read the excerpt below. Use the column on the right to guide your thinking. Then complete neurologist’s notebook 5.

From “Introduction”	Gist Notes and Vocabulary
<p>The way adolescents of today learn, play, and interact has changed more in the past 15 years than in the previous 570 since <b>Gutenberg’s popularization of the printing press</b>. The internet, iPads, cell phones, Google, Twitter, Facebook, and other modern marvels unleash a virtual gusher of information to the plugged-in teen brain.</p>	<p>This paragraph articulates the main idea.</p> <p>Gutenberg’s popularization of the printing press = Johannes Gutenberg invented the machine that made printing pages automatic. This meant that reading material became more widely available, and, therefore, more people learned to read.</p>
<p>In 2010, U.S. adolescents spent an average of 8.5 hours per day interacting with digital devices, up from 6.5 hours in just 2006. Thirty percent of the time they are simultaneously using more than one device, bringing daily total media exposure time to 11.5 hours. These numbers are a moving target and vary by survey, <b>socioeconomic status</b>, ethnicity, and geography, but all indications are that the amount of screen time has been dramatically increasing and is likely to continue to do so as the technology improves and becomes even more widely available.</p>	<p>This paragraph lists lots of evidence. Use the last sentence to help you sum it up.</p> <p>socioeconomic status = One’s socioeconomic status is determined by how much money one has.</p>
<p>The pace of “penetration” (i.e., the amount of time it takes for a new technology to be used by 50 million people) is <b>unprecedented</b>. For radio, technological penetration took 38 years; for telephone, 20; for television, 13; for the World Wide Web, 4; for Facebook, 3.6 years; for Twitter, 3 years; for iPads, 2 years; and for Google+, 88 days.</p>	<p>This paragraph is the opposite of the last paragraph. The summation is first, and then the author lists examples as evidence.</p> <p>unprecedented = If something is unprecedented, nothing like it has happened before.</p>

From "Introduction"	Gist Notes and Vocabulary
<p>The <b>pace and pervasiveness</b> of these changes, i.e., the digital revolution, raise several questions relevant to adolescent health—relevance that extends to children, teens, parents, teachers, and society at large. What are the implications, for good or ill, of the dramatic changes in the way adolescents spend their time? How can the technology be harnessed to optimize the positive and minimize the negative? Might the unprecedented rate of change itself overwhelm <b>adaptive mechanisms</b>?</p>	<p>The author lists lots of questions. How can you sum up this idea?            pace and pervasiveness = This can be restated as "how quickly and how much things have changed for a lot of people."            adaptive mechanisms = These are the things a human or animal does to adapt to its environment.</p>
<p>The digital revolution gives us unique insight into how experience shapes the brain, and, in turn, how these brain changes may change our experience. Consideration of the neurobiology and evolutionary history of the adolescent brain may provide some context to explore these questions.</p>	<p>This one is done for you in the neurologist's notebook.</p>

Giedd, Jay N. "The Digital Revolution and Adolescent Brain Evolution." National Center for Biotechnology Information. National Institutes of Health (August 5, 2012). [www.ncbi.nlm.nih.gov/pmc/articles/PMC3432415/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3432415/).

# Neurologist's Notebook 5

## Excerpt 1 of "The Digital Revolution and Adolescent Brain Evolution"

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Directions:** Use this note-catcher to get the gist of the reading. Remember that the main idea and supporting idea/details are often not just a single sentence of the text; rather, they may involve multiple sentences.

<b>Main idea:</b>	
<b>Brief background:</b>	<b>Supporting idea/detail:</b>
<b>Supporting idea/detail:</b>	<b>Supporting idea/detail:</b>
<b>Supporting idea/detail:</b>	

# Excerpt 2 of “The Digital Revolution and Adolescent Brain Evolution”

Name: \_\_\_\_\_

Date: \_\_\_\_\_

From “The Adolescent Brain: Evolution and Neurobiology”	Gist Notes and Vocabulary
<p>(1) Humans, on the other hand, are remarkably adaptable. We can survive everywhere from the frigid North and South poles to the balmy islands on the equator. With technologies developed by our brains we can even live in <b>vessels orbiting</b> our planet. Survival skills in cold climates may <b>entail</b> learning how to find shelter and obtaining nutrients from hunting. In tropical climates it may be more a matter of avoiding certain predators or identifying which fruits are edible and which are toxic.</p>	<p>vessels orbiting = entail =</p>
<p>(2) The changes in demands across time are as striking as the changes across geography. Ten thousand years ago, a blink of an eye in evolutionary terms, we spent much of our time securing food and shelter. Modern humans now spend relatively little time and energy obtaining calories (a factor that may, through <b>epigenetic</b> or other factors, be related to earlier puberty and greater height/weight). Instead many of us spend the majority of our waking hours dealing with words or symbols—a particularly <b>noteworthy</b> departure given that reading, which is approximately 5,000 years old, did not even exist for most of human history.</p>	<p>epigenetic = change in the function of cells that is not due to changes in the DNA noteworthy = interesting</p>
<p>(3) Having a highly <b>plastic brain</b> is particularly useful during the second decade, when the evolutionary demands of adolescence—being able to survive independently and reproduce—rely critically on the ability to adapt.</p>	<p>plastic brain = <i>plastic</i> here means “able to be changed”</p>

From "The Adolescent Brain: Evolution and Neurobiology"	Gist Notes and Vocabulary
<p>(4) Insight into the neurobiology of the developing brain has been greatly enhanced by the <b>advent</b> of magnetic resonance imaging (MRI), which allows exquisitely accurate pictures of brain anatomy and <b>physiology</b> without the use of ionizing radiation.</p> <p>(5) After puberty the brain does not mature by growing larger; it matures by growing more <b>specialized</b>. <b>Gray matter volumes</b> during the first three decades of life follow an inverted "U" shaped developmental <b>trajectory</b> with peak size occurring at different ages in different regions. Total <b>cortical gray matter volume</b> peaks at around age 11 in females and 13 in males. The <b>complementary</b> mechanisms of overproduction/selective elimination allow the brain to specialize in response to environmental demands.</p>	<p>advent = the invention of</p> <p>physiology = the way the brain functions</p> <p>specialized = more suited to a specific purpose</p> <p>gray matter volume = how many synapses there are in the brain</p> <p>trajectory = path</p> <p>cortical gray matter volume = how much gray matter there is in the brain</p> <p>complementary =</p>

Source: Giedd, Jay N. "The Digital Revolution and Adolescent Brain Evolution." National Center for Biotechnology Information. National Institutes of Health (August 5, 2012). [www.ncbi.nlm.nih.gov/pmc/articles/PMC3432415/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3432415/).



## Text-Dependent Questions

### Excerpt 2 of “The Digital Revolution and Adolescent Brain Evolution”

Questions	Answers
<p>In section 1, Dr. Giedd writes, “Humans, on the other hand, are remarkably adaptable.”</p> <ol style="list-style-type: none"> <li>1. What does it mean to be <i>adaptable</i>?</li> <li>2. What evidence does he give to support this statement?</li> </ol> <p>Later in section 1, Dr. Giedd gives another example of <i>adaptation</i>.</p> <ol style="list-style-type: none"> <li>3. He says that humans used to spend all their time trying to find food, but now we spend our time doing what?</li> <li>4. How is this an example of being adaptable?</li> <li>5. How might being adaptable in the past relate to the “digital revolution” you read about last night?</li> </ol>	
<p>In section 3, Dr. Giedd writes: “Having a highly <b>plastic brain</b> is particularly useful during the second decade, when the evolutionary demands of adolescence—being able to survive independently and reproduce—rely critically on the ability to adapt.”</p> <ol style="list-style-type: none"> <li>6. How might having a brain that is changing be necessary for someone to adapt?</li> <li>7. Is Dr. Giedd saying that a teenager is more adaptable than an older person? Explain your thinking with evidence from the text.</li> </ol>	
<p>In section 5, Dr. Giedd explains a process you know a lot about. He is talking about myelination, synaptic branching, and pruning. He says, “The <b>complementary</b> mechanisms of overproduction/ selective elimination allow the brain to specialize in response to environmental demands.”</p> <ol style="list-style-type: none"> <li>8. Why would overproducing and cutting back on synapses make a brain more <i>adaptable</i>?</li> </ol>	

# Entry Task

## Analyzing the Evidence

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Directions:** In Lesson 6, you learned about the adaptability of the brain. You learned that the brain is very adaptable because it literally, physically changes. Its neurons change to fit the tasks the brain needs to perform in order to thrive in whatever environment it is in.

These are all pieces of evidence from texts throughout Unit 1. Most of the following pieces of evidence support your learning from Lesson 6. **Which one of these does not?** Circle the letter and explain why in the space below.

- A. “For instance, if you play guitar every day, your brain will have more fine-motor synapses than if you spend your time listening to Fall Out Boy on your MP3 player (in that case, audio synapse would rule).” (Bernstein)
- B. “This means that teens have the potential, through their choices and behaviors they engage in, to shape their own brain development—strengthening some circuits and getting rid of others. This makes the kind of activities that teens are involved in especially important.” (Scholastic)
- C. “Your experiences and the people you affiliate with shape the way your brain ultimately develops.” (Galván)
- D. “The nerve cells that connect teenagers’ frontal lobes with the rest of their brains are sluggish. Teenagers don’t have as much of the fatty coating called myelin, or ‘white matter,’ that adults have in this area.” (Knox)
- E. “When you review or practice something you’ve learned, dendrites actually grow between nerve cells in the network that holds that memory.” (Willis)

# Excerpt 3 of “The Digital Revolution and Adolescent Brain Evolution”

Name: \_\_\_\_\_

Date: \_\_\_\_\_

From “Entertainment”	Gist Notes and Vocabulary
<p>(1) The most common forms of digital entertainment are TV (4.5 hours/day), music (3 hours/day), and non-gaming use of computers (1.5 hours/day). Next most common are video games (1.25 hours/day)—from computers, the internet, game consoles, or handheld/mobile devices.</p>	
<p>(2) Video games are a \$25 billion per year industry and are popular and available across <b>socioeconomic</b> status and gender—99% of teen boys and 94% of teen girls play video games on one or more of the above platforms. The amount of time spent on video games is increasing across all age groups as the quality and variety of games continues to improve and the availability of mobile devices becomes more <b>ubiquitous</b>.</p>	<p>socioeconomic = ubiquitous = seems to be everywhere</p>
<p>(3) Highly popular games <b>encompass</b> a wide range of genres, degree of intellectual demand, and solitary versus <b>interpersonal formats</b>. Game consoles such as Wii Fit and Kinect interact with body movement providing <b>infinitely scalable</b> physical challenges that blur the distinction between video gaming and conventional athletic endeavors.</p>	<p>encompass = interpersonal formats = infinitely scalable = it can always get higher or more challenging</p>
<p>(4) From a neurobiological perspective, the popularity of the games reflects their capacity to stimulate the brain’s reward circuitry. Dopamine is the <b>predominant molecular currency</b> of the reward system, and a key component of the circuitry is the <b>nucleus accumbens</b>. The <b>commonality</b> of reward circuitry across domains is striking. All of our basic drives (e.g., hunger, sex, sleep), all substances of abuse, and everything that may lead to addiction (i.e., compulsive behavior characterized by loss of control and continuation despite adverse consequences) increase dopamine in the nucleus accumbens.</p>	<p>predominant molecular currency = the most often used nucleus accumbens = a part of the brain that is part of the limbic system commonality =</p>

Giedd, Jay N. “The Digital Revolution and Adolescent Brain Evolution.” National Center for Biotechnology Information. National Institutes of Health (August 5, 2012). [www.ncbi.nlm.nih.gov/pmc/articles/PMC3432415/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3432415/).

## Text-Dependent Questions

### Excerpt 3 of “The Digital Revolution and Adolescent Brain Evolution”

Questions	Answers
<ol style="list-style-type: none"> <li>1. What is the purpose of the first paragraph? Is it to define terms, identify a problem, illustrate a problem with an anecdote, or give background? Why?</li> <li>2. In the second paragraph, Dr. Giedd quotes the statistic that “99% of teen boys and 94% of teen girls play video games.” What statement does this evidence support?</li> <li>3. Compare the information in the second paragraph with the different information in the third. What do they have in common? How are they different?</li> </ol> <p>If you take out the parenthetical phrases of the last sentence, it reads: “All of our basic drives, all substances of abuse, and everything that may lead to addiction increase dopamine in the nucleus accumbens.”</p> <ol style="list-style-type: none"> <li>4. What do video games have in common with our basic drives, drugs, and addictive behaviors?</li> <li>5. How might this relate to the main idea of this section that video games are popular?</li> </ol>	

# Homework

## Excerpt 4 of “The Digital Revolution and Adolescent Brain Evolution”

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Directions:** Please read the excerpt below. Then follow the scaffolding steps to summarize and rephrase the main idea.

### From “Entertainment: Attention Economy”

In the fiercely competitive video game industry, top-selling games are masterful at engaging our brain’s reward system. Homework is up against some challenging foes. Might the availability of technologies that can persistently keep dopamine levels so high raise the threshold for what our brains deem rewarding in terms of relationships, studying, or working toward other long-term goals that may not have immediate reinforcements?

### Scaffolding steps:

1. Circle five words whose definitions you would benefit from reviewing. Using a dictionary or context clues, or talking with an adult, find the definition of those words.
2. Rewrite the gist of each sentence or phrase in your own words:
  - A. In the fiercely competitive video game industry, top-selling games are masterful at engaging our brain’s reward system.

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- B. Homework is up against some challenging foes.

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C. Might the availability of technologies that can persistently keep dopamine levels so high . . .

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D. . . . raise the threshold for what our brains deem rewarding in terms of relationships, studying, or working toward other long-term goals that may not have immediate reinforcements?

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3. Now reread the paragraph again.

4. What is the problem Dr. Giedd is wondering about? Explain it in your own words.

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Bonus: Think about the words *attention* and *economy*. Explain what the title means.

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Source: Giedd, Jay N. "The Digital Revolution and Adolescent Brain Evolution." National Center for Biotechnology Information. National Institutes of Health (August 5, 2012). [www.ncbi.nlm.nih.gov/pmc/articles/PMC3432415/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3432415/).

## Unit 1 Vocabulary Quiz-Quiz-Trade Cards

neurological development	electrochemical impulse
neurons	neurotransmitter
prefrontal cortex	

limbic system	dendrites
neural impulse	synapse
axons	myelination
myelin	synaptic pruning

brain pathways	dopamine
plastic	brain plasticity
adaptable	social cognition
gray matter	neural insulation

neuroscientists	complementary
socioeconomic	adaptive mechanisms



# Analyzing the Main Ideas

## Sam Crocker

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Directions:** The audio selection you will listen to today has two main ideas. As you listen, write down at least two supporting details for each main idea. You will hear the selection three times.

<b>Main idea:</b> My attention span has gotten worse.	<b>Main idea:</b> The social interactions on Facebook are an illusion.
<b>Supporting details:</b>	<b>Supporting details:</b>

Which main idea best relates to the reading you did last night? Why?

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# Excerpt 5 of “The Digital Revolution and Adolescent Brain Evolution”

Name: \_\_\_\_\_

Date: \_\_\_\_\_

From “Digital Revolution–Social”	Gist Notes and Vocabulary
<p>(1) The human brain is a social brain. Our ability to <b>gauge</b> the moods and intentions of others, to detect the truth or falsehood of their communications, to <b>discern</b> friend from foe, and to form alliances are among its most complex and important tasks. These skills are of premier importance to fulfill our <b>biological imperatives</b> of staying alive (through the protection of the group) and reproducing. From this perspective, it is no wonder that so much of our brains is dedicated to <b>social cognition</b> . . .</p>	<p>gauge =</p> <p>discern =</p> <p>biological imperative = the thing we must do to live</p> <p>social cognition =</p>
<p>(2) The central hub of circuitry related to social skills is the late-maturing highly plastic prefrontal cortex. Like any complex skills, <b>mastery</b> requires lots of practice. Much of the discernment relies on exquisitely subtle detection of nonverbal cues such as slight changes in eye gaze, millisecond differences in speech timing, <b>synchrony</b> of response to shared environmental <b>stimuli</b>, breathing patterns, body posture, touch, odors, etc. Might the increasing reliance on digital social interactions <b>hinder</b> exposure to the “real-world” experiences necessary to master these most important skills?</p>	<p>mastery = if you have mastery in something, you are really good at it</p> <p>synchrony = occurring at the same time</p> <p>stimuli =</p> <p>hinder = stop or limit</p>

Source: Giedd, Jay N. “The Digital Revolution and Adolescent Brain Evolution.” National Center for Biotechnology Information. National Institutes of Health (August 5, 2012). [www.ncbi.nlm.nih.gov/pmc/articles/PMC3432415/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3432415/).

## Text-Dependent Questions

### Excerpt 5 of “The Digital Revolution and Adolescent Brain Evolution”

Questions	Notes
<ol style="list-style-type: none"> <li>1. Dr. Giedd states, “The human brain is a social brain.” He then goes on to describe four important social tasks that a person’s brain must be able to do. Describe those four tasks in your own words.</li> <li>2. Dr. Giedd describes the prefrontal cortex as the “late-maturing highly plastic prefrontal cortex.” What does this statement tell us about the prefrontal cortex?</li> <li>3. Referring to the social skills that a human being needs, Dr. Giedd says, “Like any complex skills, mastery requires lots of practice.” Rephrase that sentence. How might someone practice social skills?</li> <li>4. What is a <i>nonverbal cue</i>?</li> <li>5. What is one of the nonverbal cues Dr. Giedd lists?</li> </ol>	
<ol style="list-style-type: none"> <li>6. Dr. Giedd describes the nonverbal cues as “exquisitely subtle.” Which of these phrases does NOT reinforce that idea: “slight changes,” “millisecond differences,” or “breathing patterns”?</li> <li>7. Why might these be hard to practice if you are socializing digitally?</li> <li>8. Paraphrase this question in your own words: “Might the increasing reliance on digital social interactions hinder exposure to the ‘real-world’ experiences necessary to master these most important skills?”</li> </ol>	

# Growing Up Digital

## Matt Richtel

- (1) The day before the start of Vishal Singh's senior year in high school, he faces a **stark** choice on his bedroom desk: book or computer?
- (2) Vishal, a bright 17-year-old Californian who spends most of his time on Facebook, YouTube, and making digital videos, has read just 43 pages of his summer reading assignment, Kurt Vonnegut's *Cat's Cradle*. Instead of picking up the book, he clicks to YouTube.
- (3) On YouTube, "you can get a whole story in six minutes," he explains. "A book takes so long. I prefer the immediate **gratification**."
- (4) Students have always faced distractions. But computers and cellphones, and the constant stream of **stimuli** they offer, are a new challenge to focusing and learning.
- (5) Researchers say the lure of these technologies is particularly powerful for young people. But because developing brains can get used to constantly switching tasks a lot more easily than adult brains, the risk is that today's teenagers will be less able to stay focused on anything, not just schoolwork.
- (6) "Their brains are rewarded not for staying on task but for jumping to the next thing," says Michael Rich, a professor at Harvard Medical School and head of the Center on Media and Child Health in Boston. "The worry is we're raising a generation of kids in front of screens whose brains are going to be wired differently."
- (7) But even as some educators express unease about students' digital diets, they are increasingly using technology in the classroom, seeing it as a way to connect with students and give them the skills they need. Across the country, schools are equipping themselves with computers, internet, and mobile devices.
- (8) It is a **tension** on vivid display at Vishal's school, Woodside High School in Redwood City, California. Here, as elsewhere, it's not uncommon for students to send hundreds of text messages a day or spend hours playing video games, and virtually everyone is on Facebook.

## 27,000 Texts a Month

- (9) Allison Miller, 14, sends and receives 27,000 texts a month. She texts between classes, the moment soccer practice ends, while being driven to and from school, and often while studying. But it comes at a cost: She blames multitasking for the three B's on her recent progress report.
- (10) "I'll be reading a book for homework and I'll get a text message and pause my reading and put down the book, pick up the phone to reply to the text message, and then 20 minutes later realize, 'Oh, I forgot to do my homework.'"

Source: "Growing Up Digital" by Matt Richtel from the *New York Times Upfront*, January 31, 2011. Copyright © 2011 by Scholastic Inc. Reprinted by permission of Scholastic Inc.

- (11) Some shy students do not socialize through technology—they recede into it. Ramon Ochoa-Lopez, 14, plays six hours of video games on weekdays and more on weekends, leaving homework to be done in the bathroom before school.
- (12) Students say that their parents, worried about the distractions, try to police their computer time. But it's trickier with cellphones, since a lot of parents want to be able to call their children at any time, so simply taking the phone away isn't an option.
- (13) Sam Crocker, Vishal's closest friend, who has straight A's but lower SAT scores than he would like, blames the internet's distractions for his inability to finish either of his two summer-reading books.
- (14) "Facebook is amazing because it feels like you're doing something and you're not doing anything," Sam says. "It's the absence of doing something, but you feel gratified anyway."
- (15) He concludes: "My attention span is getting worse."

## No Downtime

- (16) That's what has doctors worried. "Downtime is to the brain what sleep is to the body," says Dr. Rich of Harvard Medical School. "But kids are in a constant mode of stimulation."
- (17) Rich isn't suggesting young people toss out their phones and computers, but that they take a more balanced approach to what he says are powerful tools necessary to compete and succeed in modern life.
- (18) Vishal has mixed feelings about technology. "If it weren't for the internet, I'd focus more on school and be doing better academically," he says. But thanks to the internet, he says, he's discovered and pursued his passion: filmmaking.
- (19) Vishal often spends hours working on music videos or film projects with sophisticated film-editing software that he taught himself how to use—and then he's focused in a way he rarely is when doing homework. He hopes colleges will be so impressed by his portfolio that they'll overlook his school performance.
- (20) Some teachers are alarmed by what they see. Marcia Blondel, a veteran English teacher, has resorted to having students read aloud in class because many lack the attention span to read assignments on their own.
- (21) "You can't become a good writer by watching YouTube, texting, and emailing a bunch of abbreviations," says Blondel.
- (22) By late October, Vishal's grades began to slip. Vishal says he's investing himself more in his filmmaking. But he is also using Facebook late at night and surfing for videos on YouTube. Evidence of the shift comes in a string of Facebook updates.
- (23) Saturday, 11:55 p.m.: Editing, editing, editing.
- (24) Sunday, 3:55 p.m.: 8+ hours of shooting, 8+ hours of editing. All for just a three-minute scene. Mind = Dead.
- (25) Sunday, 11:00 p.m.: Fun day, finally got to spend a day relaxing . . . now about that homework. . .

# Text-Dependent Questions

## “Growing Up Digital”

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Questions	Answers
1. <b>After paragraph 4:</b> How does the story of Vishal help us visualize and understand the main idea in paragraph 4?	
2. <b>After paragraph 8:</b> Why would the use of technology in school be described as a “tension”?	
3. <b>After paragraph 16:</b> Why would the author choose to use quotations from doctors and researchers in this article?	
4. <b>After paragraph 19:</b> What is the point of describing the <i>benefits</i> of technology, such as Vishal’s filmmaking, in an article about the <i>dangers</i> of technology?	

Questions	Answers
5. In this article, how does technology affect Vishal? How do you think it might affect his brain? What do you know about the adolescent brain that makes you think this?	

# Neurologist's Notebook 6

## "Growing Up Digital"

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Directions:** Use this note-catcher to get the gist of the reading. Remember that the main idea and supporting details are often not just a single sentence of the text; rather, they may involve multiple sentences.

<b>Main idea:</b>	
<b>Brief background:</b>	<b>Supporting idea/detail:</b>
<b>Supporting idea/detail:</b>	<b>Supporting idea/detail:</b>
<b>Supporting idea/detail:</b>	<b>Supporting idea/detail:</b>



# Reflection Grid

Name: \_\_\_\_\_

Date: \_\_\_\_\_

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## Assessment Text

### “YouTrouble”

In 2009, a 15-year-old boy decided to become famous. His plan was to soak a basketball in gasoline, set it on fire, and sink a perfect three-pointer. He would film the glorious scene and post the video on YouTube. He dreamed of being an internet celebrity.

Unfortunately, the plan didn’t work out quite as he imagined. As he took his shot, his clothing burst into flames. He was rushed to the hospital with second- and third-degree burns on his chest and legs.

He survived, but he’ll have the scars forever.

### No Pain, No Gain

YouTube hosts countless clips of people, many of them young teens, attempting wild, dangerous, and downright *stupid* stunts. Many of the videos are inspired by shows like *Jackass* and *Fear Factor*, and they cover pretty much any risky activity you can imagine: playing with fire, “surfing” on top of moving cars, soaring off **flimsy** homemade ramps on bikes and skateboards, shooting people point-blank with paintball guns.

Stunt videos on YouTube get millions of hits. But according to some experts, they are far from harmless entertainment. These experts say that by hosting such videos, YouTube encourages young viewers to take potentially deadly risks.

Research by the Centers for Disease Control and Prevention shows that more than 180,000 Americans die from accidental injuries every year. That works out to one person every three minutes. More than 14,000 of them are under the age of 19.

Is YouTube to blame?

### Laughing at Violence

Daredevils—from the “human cannonballs” of the 1800s, to legendary stuntman Evel Knievel, to *Jackass*’s Johnny Knoxville—are nothing new. People have always found it entertaining to watch others attempt risky things, and also, sometimes, to watch them fail. Audiences love to see a good wipeout or blowup, at least as long as it’s not too serious. In fact, viewers often shriek with laughter at stunts gone wrong.

Laughter may seem like an odd reaction to violence but, says family therapist Clair Mellenthin, “our **tendency** to laugh at people getting hurt goes back in human history for centuries.” She believes such laughter is a defense mechanism—a way of coping with disturbing situations. “Even little babies laugh when they see people fall down,” she says.

Source: “You Trouble” by Justine O’Neill from *Scholastic Choices*, September 2012. Copyright © 2012 by Scholastic Inc. Reprinted by permission of Scholastic Inc.

Some of the earliest Greek comedies featured characters falling off the stage, being chased by wild animals, or smacking into walls. And now, in the age of the internet, anyone with a camera and a YouTube account can create this kind of “entertainment.”

YouTube provides access to an audience of millions. Many of those viewers—particularly teenage viewers—are inspired by what they see and are eager to try it for themselves. “YouTube has taken the one-upmanship of playing in the neighborhood to the global level,” says Mellenthin. “The peer pressure is greatly increased, because now we can see what others are doing **literally** around the world.”

## Don’t Blame Me, Blame My Brain

There is another reason, beyond peer pressure, that many teens are willing to risk their safety and even their lives for the sake of a 30-second stunt video: Their brains are telling them to. During your teen years, the area of your brain that seeks pleasure and reward is well-developed. However, the area of your brain that controls judgment, the prefrontal cortex, is not. This fact, combined with the hormones that are surging through your body and your natural desire for new experiences, can lead to serious risk-taking: The voice in your head that tells you to do something exciting is a lot louder than the one that tells you why you shouldn’t.

This doesn’t mean risk-taking teens aren’t thinking. Often, they can see quite clearly how dangerous a certain activity is. They just do it anyway.

“A lot of [teens’] risk-taking is not **impulsive**,” says Valerie Reyna, a psychology professor at Cornell University. After carefully considering a risk, teens are likely to decide it’s worth it for the thrill. Adults are more likely to skip this weighing of pros and cons and automatically rule out high-risk activities.

It’s true that the odds of being killed while leaping from your bedroom window into your swimming pool may be relatively small. But there’s a problem with this logic that most teens don’t quite get. That is, no matter how small the risk, the worst possible thing *can* happen to you. And as Reyna says, when trying something risky, “it only takes once” to be killed.

## Not Worth It

Fully developed brains or no, Reyna believes, teens do have the ability to take precautions and behave sensibly. Most know that no matter how exciting or hilarious something they saw in a video might be, they shouldn’t do it if it’s obviously dangerous.

Defenders of YouTube’s right to display stunt videos argue that it’s not YouTube’s responsibility to censor its content. Instead, they say, it’s parents who must **ensure** that their teenage kids are behaving safely and responsibly.

It’s not as if YouTube isn’t making an effort, though. According to its official Community Guidelines, the site “draw[s] the line at content that’s intended to . . . encourage dangerous, illegal activities that have an **inherent** risk of serious physical harm or death.” YouTube staff members comb through the website 24 hours a day, looking for videos that violate their policies—but are they doing enough?

Whether or not you believe YouTube should have stricter rules, here's a piece of advice: Never light a basketball on fire.

That's just stupid.

# You **Safe**

Millions of teens are injured in accidents every year—even those not looking for YouTube fame. Here are five ways to lower your risk of getting hurt:

- 1. Wear a seat belt.** In the U.S., car accidents are the leading cause of death and injury to teens. Wearing a seat belt cuts the risk of serious injury by 50 percent.
- 2. Wear a helmet.** Whether you're biking, skiing, or skateboarding, wearing a helmet can reduce the chance of serious head injury by 40 percent and death by 27 percent.
- 3. Take the class.** Boating might look easy. So might driving a car. But kids who take even short training programs dramatically reduce their chances of getting hurt. Studies show that driver-education programs can reduce fatal car crashes by 40 percent.
- 4. Follow the rules.** It sounds obvious, but many accidents can be avoided simply by obeying laws and guidelines. Ninety-two percent of ATV-related deaths are associated with warned-against behaviors, such as driving at excessive speeds or carrying too many passengers.
- 5. Don't get burned.** Stay far away from fireworks, no matter how cool they look. More than 9,300 people in the U.S. are seriously injured by fireworks each year, and 45 percent are under the age of 14.

*Sources:* 1. National Organizations for Youth Safety; 2. Study: "Bicycle helmets and injury prevention: A formal review" (Attewell, Robyn, et al.); 3. Centers for Disease Control and Prevention; 4. Special Vehicle Institute of America; 5. FEMA.

# End-of-Unit 1 Assessment

## Analyzing the Main Idea and Supporting Details in “YouTrouble”

Name: \_\_\_\_\_

Date: \_\_\_\_\_

1. What is the main idea of this article? (LAFS.7.RI.1.2)
  - A. Teens see lots of dangerous stunts on YouTube and sometimes try these themselves. People disagree about the best way to prevent this.
  - B. It is human nature to take risks. Some people are taking it too far.
  - C. Teens are especially susceptible to risk because they have an underdeveloped prefrontal cortex.
  - D. Parents, not YouTube, should make sure that teens are not taking foolish risks.
2. Please fill in the chart below. (LAFS.7.RI.1.1)

<b>Main idea:</b>	
<b>Background or context for this idea:</b>	
<b>Supporting idea:</b>	<b>Supporting idea:</b>

<b>Supporting idea:</b>	<b>Supporting idea:</b>
<b>Supporting idea:</b>	<b>Supporting idea:</b>
<b>Supporting idea:</b>	<b>Supporting idea:</b>

3. Why does the author start the article by quoting the statistic that “one person every three minutes” dies from an accidental injury? (LAFS.7.RI.1.1)
  - A. He wants to show that this is a serious problem.
  - B. He wants to show that YouTube is very dangerous.
  - C. He wants the reader to be more careful.
  - D. He wants the reader to be sad.
4. What is the purpose of the section called “Laughing at Violence”? (LAFS.7.RI.2.5)
  - A. To give an example of risky entertainers, like daredevils
  - B. To explain why people laugh at other people taking risks and what we should do about it
  - C. To prove that YouTube is not to blame because people have been laughing at violence for a long time
  - D. To explain the history of people taking risks for entertainment and how YouTube fits into that big picture

5. Go back to the section titled “No Pain, No Gain.” The word *flimsy* (in the first paragraph) means “easily broken.” Which other word in the sentence best helps you get this meaning? (LAFS.7.L.3.6)
  - A. Soaring
  - B. Ramp
  - C. Homemade
  - D. Skateboard
6. Most of the evidence in this text supports the idea that YouTube creates a situation where there is greater peer pressure on kids to do unwise things. Which of the following pieces of evidence does NOT support this idea? (LAFS.7.RI.1.1)
  - A. “YouTube provides access to an audience of millions.”
  - B. “The peer pressure is greatly increased because now we can see what others are doing literally around the world.”
  - C. “There is another reason, beyond peer pressure, that many teens are willing to risk their safety and even their lives for the sake of a 30-second stunt video.”
  - D. “YouTube has taken the one-upmanship of playing in the neighborhood to the global level.”
7. The text states, “And now, in the age of the internet, anyone with a camera and a YouTube account can create this kind of ‘entertainment.’” Which piece of evidence best supports this idea? (LAFS.7.RI.1.1)
  - A. “He would film the glorious scene and post the video on YouTube. He dreamed of being an internet celebrity.”
  - B. “Many of those viewers—particularly young viewers—are inspired by what they see and are eager to try it for themselves.”
  - C. “Often they see quite clearly how dangerous a certain activity is. They just do it anyway.”
  - D. “Defenders of YouTube’s right to display stunt videos argue that it is not YouTube’s responsibility to censor its content.”
8. According to Valeria Reyna, why do teens take risks? (LAFS.7.RI.1.1)
  - A. They aren’t supervised by their parents enough.
  - B. They can’t weigh the pros and cons because their prefrontal cortex isn’t developed.
  - C. They decide to do something even though they know it’s dangerous because they think it’s worth the thrill.
  - D. They do it because they see videos of people doing it.
9. What is the meaning of the word *impulsive*? (LAFS.7.L.3.6)
  - A. Done without considering the consequences
  - B. Disgusting or off-putting
  - C. Thoughtfully executed
  - D. Pulsating

10. Why might the author have included the box “YouSafe” in the text, even though it has nothing to do with YouTube videos? (LAFS.7.RI.2.5)

- A. To give teens tips to keep them safe
- B. To give teens ways to be safe when they are making their own YouTube video
- C. To give teens statistics that will convince them to make wise choices
- D. To give teens information about the kinds of accidents that can happen



# Independent Reading Check-In

Name: \_\_\_\_\_

Date: . \_\_\_\_\_

1. Did you meet your independent reading goal for today's check-in?

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2. If yes, what helped you do that?

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3. If no, what got in your way? How can I help you?

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4. Below, write a brief paragraph explaining how your book does or does not connect to your current experience as a middle schooler. Use at least two pieces of specific evidence from the book to support your claim, and be sure to explain how that evidence supports your claim.

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