

## UNIT A: LESSON 5

### LEARNING TARGETS

#### INSTRUCTIONS FOR TEACHERS:

- Refer students to the standards and objectives.
- Review the standards and objectives with students one at a time.
- At the end of the lesson, ask students what they did in class to meet the standards.

#### INSTRUCTIONS FOR STUDENTS:

Listen as your teacher reviews the standards and objectives. Your teacher will call on an individual or pair to explain what they mean.

#### Learning Target:

I can **determine** the **main** ideas and **supporting details** in the **article** “The Digital Revolution and Adolescent Brain Evolution.”

#### Learning Target:

I can use a **variety** of **strategies** to figure out the meaning of new vocabulary.

*determine* – decide

*main* – central or most important

*supporting details* – helping ideas

*article* – a short text in a newspaper or magazine

*variety* – several or many different

*strategy* – method, or way

## ACQUIRING AND USING VOCABULARY

### INSTRUCTIONS FOR TEACHERS:

- Review student instructions.
- Familiarize students with their glossary. It is located in Appendix A (Glossary; labeled “Appendix: Glossary” in the student version). Tell students to use the glossary throughout the lesson.
- Pre-teach the vocabulary selected for extended instruction, provided as word cards in Appendix B (Teacher Resources). This vocabulary is abstract and critical to understanding the text.

### INSTRUCTIONS FOR STUDENTS:

Your teacher will pre-teach several key words. Use your glossary for the rest of the lesson to find meanings for words you don't know. Words that are **bolded** in the text and word banks can be found in the glossary. The glossary is located in the Appendix at the end of the lesson.

## THINKING LOG

### INSTRUCTIONS FOR TEACHERS:

- Read the guiding question and text aloud to students, modeling appropriate pace and intonation.
- During the read-aloud, define words and phrases in context that students are unlikely to know, drawing definitions from the glossary when you can. Translations, examples, gestures, and visuals also help.
- Ask students to read the text on their own and work with a partner to answer supplementary questions.
- Ask students to use their glossary to help them with word meanings.
- Call on pairs to answer the supplementary questions.
- Discuss the guiding question(s) as a group and then have students write the answer in their student chart.

### INSTRUCTIONS FOR STUDENTS:

Your teacher will ask you a guiding question that you will think about as your teacher reads the text aloud to you. As your teacher reads the text aloud, listen and follow along in your text. After the text has been read aloud, work with a partner to reread the text and answer the supplementary questions. Use your glossary to help you. Your teacher will review the answers with the class. You will then discuss the guiding question(s) with your teacher and the class. Finally, you will complete a written response to the guiding question(s).

**GUIDING QUESTION:** *How has the human brain evolved? Why is it helpful for teens for the brain to be especially moldable, or highly plastic, in adolescence?*

### THE DIGITAL REVOLUTION AND ADOLESCENT BRAIN EVOLUTION

#### *EXCERPT 2: THE ADOLESCENT BRAIN: EVOLUTION AND NEUROBIOLOGY*

Humans 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 vessels **orbiting** our planet. Survival skills in cold **climates** may entail 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.

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

epigenetic 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 noteworthy departure, given that reading, which is approximately 5,000 years old, did not even exist for most of human history.

Having a highly **plastic** brain 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**.

Insight into the neurobiology of the developing brain has been greatly **enhanced** by the advent of magnetic resonance imaging (MRI), which allows exquisitely **accurate** pictures of brain anatomy and physiology without the use of ionizing radiation.

After puberty, the brain does not mature by growing larger; it matures by growing more **specialized**. **Gray matter volumes** during the first three **decades** of life follow an inverted "U"-shaped developmental trajectory, with peak size **occurring** at different ages in different **regions**. Total cortical gray matter volume peaks at about age 11 years in girls and age 13 years in boys. The **complementary** mechanisms of overproduction/ selective elimination allow the brain to specialize in response to **environmental** demands.

**WORD BANK:**

5,000	<b>environmental</b>	specializes	vessels
<b>adapt</b>	experiences	<b>survive</b>	<b>volume</b>
brain	magnetic resonance imaging	<b>symbols</b>	words
change	pictures	ten	
earth	<b>securing</b>	thirteen	
eleven	<b>specialized</b>	twenty	

**SUPPLEMENTARY QUESTIONS:**

1. *What is evidence that humans are amazingly adaptable?*

The evidence that humans are amazingly adaptable is that humans can survive everywhere on earth.

2. *Where can humans live using technologies?*

Humans can live in vessels (spaceships) circling our planet.

3. *What did humans do with most of their time ten thousand years ago?*

Humans spent their time securing (finding) food and shelter.

4. *What does it mean to say that ten thousand years is just “a blink of an eye”?*

It means that ten thousand years ago is a short (short/long) time when you think of all of history.

5. *What do most humans do today instead of finding food and shelter?*

Humans today spend the majority of time reading words or symbols.

6. *Why is this so amazing?*

This is so amazing because humans have been reading for only about 5,000 years.

7. *What does it mean to have a highly “plastic” brain?*

Having a highly “plastic” brain means that the human brain can change.

8. *The author states that a highly plastic brain is very useful for the second decade. What does the second decade mean?*

The author is talking about the second decade, or second ten years, of human life. Those years are from ages eleven to twenty.

9. *Why is it so important that the brain can change easily during the second decade?*

It is so important because this is a time when humans need to adapt in order to survive independently.

10. *What technology has helped neurobiology?*

The technology is magnetic resonance imaging (MRI).

11. *What can MRI do?*

MRI can take very accurate pictures of the brain.

12. *Does the brain get bigger when children reach adolescence?*

No, it doesn't (Yes it does/No, it doesn't). The brain gets more specialized.

13. *When does the brain's size reach its peak in girls and boys?*

For girls, the brain's volume is greatest at approximately eleven years old, and for boys the volume is greatest at approximately thirteen years old.

14. *When the brain no longer grows in size, what happens?*

The brain specializes as a result of environmental demands.

15. *What are environmental demands?*

Environmental demands are experiences that people have interacting with everything around them.

**RESPONSE TO GUIDING QUESTION(S):**

*How has the human brain evolved? Why is it helpful for teens for the brain to be especially moldable, or highly plastic, in adolescence?*

*Suggested Response:* The human brain is very adaptable. Ten thousand years ago humans spent most of their time securing food and shelter. Today many of us spend most of the time reading words and symbols. The brain has had to adapt for these purposes. The brain also adapts for each person as they grow older. The brain is most plastic during adolescence when young people need to change to be able to survive independently.

## NEUROLOGIST NOTEBOOK

<b>INSTRUCTIONS FOR TEACHERS:</b> <ul style="list-style-type: none"> <li>Review student instructions.</li> </ul>	
<b>INSTRUCTIONS FOR STUDENTS:</b> Work with a partner. Use your neurologist notebook to write down key, or important, information from the text. You will write down main ideas and some details, or specific information, about each main idea. You can use information from your Thinking Log. Some information is already filled in for you.	
<b>WORD BANK:</b> <b>adaptable, adapted, brain, environmental, experiences, faster, food, plastic, regions, shelter, specialized, survive, symbols, technology, teens, time, words</b>	
<b>Summary from yesterday:</b>  Teens are encountering more <u>technology</u> at a <u>faster</u> pace than ever before. This is an opportunity to see how well humans adapt to new <u>experiences</u> .	
<b>Main idea:</b>  Humans are <u>adaptable</u> .	<b>Supporting details:</b>  Humans have <u>adapted</u> to every type of climate. We have learned how to <u>survive</u> everywhere.
<b>Main idea:</b>  Humans have adapted through <u>time</u> as well as in different geographic <u>regions</u> .	<b>Supporting details:</b>  Humans used to spend most of their time securing, or getting, <u>food</u> and <u>shelter</u> . We now spend most of our time working with <u>words</u> and <u>symbols</u> .
<b>Main idea:</b>  Changes in the <u>brain</u> when we are <u>teens</u> help us survive.	<b>Supporting details:</b>  Humans have a <u>plastic</u> brain that helps us adapt. After puberty, the brain grows more <u>specialized</u> or made for a special purpose, in response to <u>environmental</u> demands, or needs.

## FUNCTIONAL ANALYSIS

### INSTRUCTIONS FOR TEACHERS:

- Review student instructions for functional analysis with the whole class.
- Complete the functional analysis with the whole class.
- Have students work with a partner to rewrite the sentence in their own words.

### INSTRUCTIONS FOR STUDENTS:

Work with your class to analyze an important sentence(s) from the text.

- Every sentence has someone or something that *does* something. First you determine this *who* or *what*.
- Every sentence has something that they *do* or *did*. Figure that part out next. Now you have the most important parts of the sentence in place.
- Then you will figure out what they did the action *to* or *for*.
- Finally, you will write the descriptive details.
- Write your answers in the spaces below.
- When you are done, write the sentence again in your own words.

You may want to use definitions from the glossed text in the sections above.

### *Functional Analysis:*

*Many of us spend the majority of our waking hours dealing with words or symbols—a particularly noteworthy departure, given that reading, which is approximately 5,000 years old, did not even exist for most of human history.*

WHO: *Many of us*

WHAT HAPPENED (Action): *spend*

WHAT: *the majority of our working hours*

DOING WHAT: *dealing with words or symbols*

Transition: *[This is] a particularly noteworthy departure given that...*

WHAT: *Reading*

DESCRIPTOR: *which is approximately 5,000 years old*

WHAT HAPPENED: *did not*

WHAT: *even exist*

DESCRIPTOR (WHEN): *for most of human history*

**What the sentence says:**

**My own words:**

Many of us

spend



the majority of our waking hours	_____
dealing with words or symbols	_____
[This is] a particularly noteworthy departure given that	this is a big deal because
reading	reading
which is approximately 5,000 years old	_____
did not even exist	_____
for most of human history	_____
<b>Write the sentence in your own words and then explain it to your partner.</b>	
_____	
_____	
This is a big deal because	
_____	
_____	

## EXIT TICKET

<b>INSTRUCTIONS FOR TEACHERS:</b> <ul style="list-style-type: none"> <li>Review student instructions with the whole class.</li> </ul>	
<b>INSTRUCTIONS FOR STUDENTS:</b> This graphic organizer will help you keep track of information about the brain for all of the readings. Each day you will write down new information from each reading. <ul style="list-style-type: none"> <li>First, write information about how humans have adapted to different geographical regions.</li> <li>Next, write information about how humans have adapted to different times.</li> <li>Then, write information about what makes us so adaptable.</li> <li>Then write how human adaptation can help us in the digital revolution (<i>so what?</i>).</li> </ul>	
<b>WORD BANK:</b> changes, cold, food, hot, <b>plastic</b> , <b>shelter</b> , <b>survive</b> , <b>symbols</b> , words, working	
<b>Human evolution across geographical regions:</b>	Humans are able to live in <u>cold</u> places and in <u>hot</u> places. Humans have <u>adapted</u> to survive.
<b>Human evolution across time:</b>	Humans used to spend most of their time securing <u>food</u> and <u>shelter</u> . Now, humans spend most of their time <u>working</u> with <u>words</u> and <u>symbols</u> .
<b>Why we are adaptable:</b>	Humans are so adaptable because our brains are <u>plastic</u> . Teen brains undergo <u>changes</u> that help them <u>survive</u> .
<b>So what?</b>	[Write how human adaptation can help us in the digital revolution:] If humans adapted in the past, then _____

## Appendix A: Glossary

Word	Definition	Example
<i>accurate</i>	careful and exact	Magnetic resonance imaging (MRI) allows <b>accurate</b> pictures of the brain.
<i>adapt (adaptable, adapted)</i>	adjust or get used to something new	Humans are remarkably <b>adaptable</b> .
climate	the normal weather in a place	Survival skills in cold <b>climates</b> may entail learning how to find shelter and obtaining nutrients from hunting.
<i>complementary mechanism*</i>	two processes that become whole or are better when they are combined	The <b>complementary mechanisms</b> of overproduction and selective elimination allow the brain to specialize in response to environmental demands.
<i>decade</i>	ten years	Having a highly plastic brain is useful during the second <b>decade</b> of life.
edible	safe to eat	In tropical climates, survival may be more a matter of avoiding predators or identifying which fruits are <b>edible</b> and which are toxic.
<i>enhance</i>	improve	Insight into the developing brain has been greatly <b>enhanced</b> by the advent of magnetic resonance imaging (MRI).
<i>environment (environmental)</i>	everything that surrounds living things and affect growth and health; the natural world	The complementary mechanisms of overproduction and selective elimination allow the brain to specialize in response to <b>environmental</b> demands.
<i>factor</i>	something that makes a difference in a result or outcome	Modern humans now spend relatively little time and energy obtaining calories, a <b>factor</b> that may be related to earlier puberty and greater height and weight.
gray matter*	the part of the brain that we use for moving, thinking, logic, and memory	Total <b>gray matter</b> volume peaks at about age 11 years in girls and age 13 years in boys.

Word	Definition	Example
independent (independently)	not needing help or support from someone else; self-reliant	The evolutionary demands of adolescence include being able to survive <b>independently</b> and reproduce.
<i>majority</i>	most	Many of us spend the <b>majority</b> of our waking hours dealing with words or symbols.
<i>obtain</i> ( <i>obtaining</i> )	get or gain	Survival skills in cold climates may entail learning how to find shelter and <b>obtaining</b> nutrients from hunting.
<i>occur</i> ( <i>occurring</i> )	take place or happen	Gray matter development varies, with peak size <b>occurring</b> at different ages in different regions.
orbit (orbiting)	circle around something	With technologies developed by our brains, we can even live in vessels <b>orbiting</b> our planet.
particularly	in or to an unusual degree or amount	Having a highly plastic brain is <b>particularly</b> useful during the second decade.
plastic*	easily shaped or molded	Having a highly <b>plastic</b> brain is particularly useful during the second decade.
regions	areas	Gray matter volumes during the first three decades of life follow an inverted "U"-shaped developmental trajectory, with peak size occurring at different ages in different <b>regions</b> .
<i>secure</i> ( <i>securing</i> )	get	Ten thousand years ago, we spent much of our time <b>securing</b> food and shelter.
shelter	a place that gives you protection against weather or danger	Survival skills in cold climates may entail learning how to find <b>shelter</b> and obtaining nutrients from hunting.
specialized	very good at a specific thing	After puberty, the brain does not mature by growing larger; it matures by growing more <b>specialized</b> .

<b>Word</b>	<b>Definition</b>	<b>Example</b>
<i>survive</i> ( <i>survival</i> )	continue to live	We can <b>survive</b> everywhere, from the frigid North and South Poles to the balmy islands on the Equator.
<i>symbol</i>	a picture or sign that represents, or means, something else (e.g., '+' means 'plus')	Many of us spend the majority of our waking hours dealing with words or <b>symbols</b> .
<i>volume</i>	amount or size	Total gray matter <b>volume</b> peaks at about age 11 years in girls and age 13 years in boys.

*\*Vocabulary from the Expeditionary Learning lessons.  
Italicized words are from the Academic Word List.*

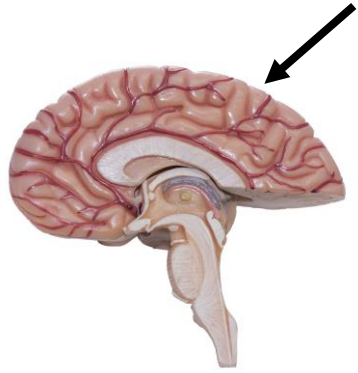
## Appendix B: Teacher Resources

### complementary mechanism



- Look at the first picture. Only the correct, or right, key will open the lock. You must have both the key and lock to lock something.
- The second picture is similar. Plants need insects, like this butterfly, to reproduce, or make more plants. And insects need plants for food. They need each other to survive, or live.
- Both pictures are examples of complementary mechanisms. Complementary mechanisms are things or processes that work perfectly together.
- Partner talk: What will happen if one part of the complementary mechanism is not there?

## gray matter



- This picture shows a model of a human brain. The arrow is pointing to gray matter.
- Gray matter is made of neurons that are not myelinated. (Recall, or remember, that myelin protects the neuron). Gray matter is found throughout the brain. But we often say gray matter to mean the part of the brain that we use for moving, thinking, logic, and memory.
- Some examples of things you use gray matter for are riding a bicycle or doing your school work.
- Partner talk: Can you name some other examples of things you do that use gray matter?