UNIT A: LESSON 5

LEARNING TARGETS

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 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 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	**environmental**	specializes	vessels
adapt	experiences	**survive**	**volume**
brain	magnetic resonance imaging	**symbols**	words
change	pictures	ten	
earth	**securing**	thirteen	
eleven	**specialized**	twenty	

SUPPLEMENTARY QUESTIONS:

1. What is evidence that humans are amazingly adaptable?

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

2. Where can humans live using technologies?

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

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

Humans spent their time _____ (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/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 _____ or_____.

6. Why is this so amazing?

This is so amazing because humans have been reading for only about _____ years.

7. What does it mean to have a highly "plastic" brain?
Having a highly "plastic" brain means that the human brain can _____.

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 _____years, of human life. Those years are from ages_____ to_____.

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 _____ in order to _____ independently.

10. What technology has helped neurobiology?
The technology is _____ (MRI).

11. What can MRI do?
MRI can take very accurate _____ of the _____.

12. Does the brain get bigger when children reach adolescence?
_____(Yes it does/No, it doesn't). The brain gets more _____.

13. When does the brain's size reach its peak in girls and boys?
For girls, the brain's _____ is greatest at approximately _____ years old, and for boys the _____ is greatest at approximately _____ years old.

14. When the brain no longer grows in size, what happens?
The brain _____ as a result of_____demands.

15. What are environmental demands?
Environmental demands are _____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?Response:

_____
_____
_____
_____
_____.

NEUROLOGIST NOTEBOOK

INSTRUCTIONS FOR STUDENTS:
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.

WORD BANK:
adaptable, **adapted**, brain, **environmental**, experiences, faster, food, **plastic**, **regions**, **shelter**, **specialized**, **survive, symbols**, technology, teens, time, words

Summary from yesterday:

Teens are encountering more _____ at a _____ pace than ever before. This is an opportunity to see how well humans adapt to new _____.

Main idea: Humans are _____.	**Supporting details**: Humans have _____ to every type of climate. We have learned how to _____ everywhere.
Main idea: Humans have adapted through _____ as well as in different geographic _____.	**Supporting details**: Humans used to spend most of their time securing, or getting, _____ and _____. We now spend most of our time working with _____ and _____.
Main idea: Changes in the _____ when we are _____ help us survive.	**Supporting details**: Humans have a _____brain that helps us adapt. After puberty, the brain grows more _____ or made for a special purpose, in response to _____ demands, or needs.

FUNCTIONAL ANALYSIS

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* _____

WHAT HAPPENED (Action): _____

WHAT: *the majority of our* _____ _____

DOING WHAT: _____ *with* _____ *or* _____

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

WHAT: *Reading*

DESCRIPTOR: *which is* _____ _____*years old*

WHAT HAPPENED: _____ *not*

WHAT: even_____

DESCRIPTOR (WHEN): *for most of* _____ _____

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	_____

Write the sentence in your own words and then explain it to your partner.

_____

_____ .

This is a big deal because

_____

_____ .

EXIT TICKET

INSTRUCTIONS FOR STUDENTS:
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.

- First, write information about how humans have adapted to different geographical regions.
- Next, write information about how humans have adapted to different times.
- Then, write information about what makes us so adaptable.
- Then write how human adaptation can help us in the digital revolution (*so what?*).

WORD BANK:
changes, cold, food, hot, **plastic, shelter**, **survive, symbols**, words, working

Human evolution across geographical regions:	Humans are able to live in _____places and in _____places. Humans have _____ to survive.
Human evolution across time:	Humans used to spend most of their time securing _____ and _____. Now, humans spend most of their time _____ with _____ and _____.
Why we are adaptable:	Humans are so adaptable because our brains are _____. Teen brains undergo _____ that help them _____.
So what?	[*Write how human adaptation can help us in the digital revolution*:] If humans adapted in the past, then _____.

Appendix: Glossary

Word	Definition	Example
accurate	careful and exact	Magnetic resonance imaging (MRI) allows **accurate** pictures of the brain.
adapt (adaptable, adapted)	adjust or get used to something new	Humans are remarkably **adaptable**.
climate	the normal weather in a place	Survival skills in cold **climates** may entail learning how to find shelter and obtaining nutrients from hunting.
complementary mechanism	two processes that become whole or are better when they are combined	The **complementary mechanisms** of overproduction and selective elimination allow the brain to specialize in response to environmental demands.
decade	ten years	Having a highly plastic brain is useful during the second **decade** of life.
edible	safe to eat	In tropical climates, survival may be more a matter of avoiding predators or identifying which fruits are **edible** and which are toxic.
enhance	improve	Insight into the developing brain has been greatly **enhanced** by the advent of magnetic resonance imaging (MRI).
environment (environmental)	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 **environmental** demands.
factor	something that makes a difference in a result or outcome	Modern humans now spend relatively little time and energy obtaining calories, a **factor** 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 **gray matter** 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 **independently** and reproduce.
majority	most	Many of us spend the **majority** of our waking hours dealing with words or symbols.
obtain (obtaining)	get or gain	Survival skills in cold climates may entail learning how to find shelter and **obtaining** nutrients from hunting.
occur (occurring)	take place or happen	Gray matter development varies, with peak size **occurring** at different ages in different regions.
orbit (orbiting)	circle around something	With technologies developed by our brains, we can even live in vessels **orbiting** our planet.
particularly	in or to an unusual degree or amount	Having a highly plastic brain is **particularly** useful during the second decade.
plastic	easily shaped or molded	Having a highly **plastic** 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 **regions**.
secure (securing)	get	Ten thousand years ago, we spent much of our time **securing** 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 **shelter** 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 **specialized**.

Word	Definition	Example
survive (survival)	continue to live	We can **survive** everywhere, from the frigid North and South Poles to the balmy islands on the Equator.
symbol	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 **symbols**.
volume	amount or size	Total gray matter **volume** peaks at about age 11 years in girls and age 13 years in boys.