SCHOLASTIC TEACHER'S GUIDE

"WIRING" YOUR BRAIN

Dear Teacher:

As a teacher of teens, you are aware of the critical importance of empowering them with facts to make informed decisions that affect their lives.

The second article in this year's *Heads Up* series highlights a very important brain process under way in teens—*synaptic pruning*—in which the brain becomes more efficient by reinforcing connections it uses and needs while also pruning connections it does not use.

Through scientific information, students will see that their choices today can help to shape and "wire" how their brains will operate as adults. They'll also see the risks that drugs pose during this important time in their lives.

I urge you to share this important article with your students.

Sincerely,

Nora D. Volkow, M.D.
Director, National Institute on Drug Abuse

In This Installment:

- **Student article:** Students will learn how neurons communicate in the brain to promote learning and skill development.
- **Student work sheet:** Through a deciphering and repetition exercise, students will experience their brain's ability to become faster at a new skill.

Lesson and Work Sheet:

The lesson below and the reproducible work sheet on the reverse side will help students understand how the network of neurons in the brain communicates through synapses to create, learn, and shape a skilled and experienced individual. Students will discover that they can have some control over how their brains develop.

Standards Alignment:
These *Heads Up* materials are Common Core–ready and are also aligned with Next Generation Science Standards (NGSS). Visit **scholastic.com/headsup/standards** for a complete standards chart.

Before-Reading Questions:
- What do you know about how the brain develops in children, teens, and adults? Do you think that there is anything *you* can do to affect your own brain development?
- What do you know about how drugs can affect the way a person's brain develops?

After-Reading Questions (factual responses in *italics*):
- What is *synaptic pruning*? *(Synaptic pruning is the process by which synapses that are used repeatedly become strengthened and more efficient, while unused synapses die off. Synaptic pruning peaks in childhood and reaches its final stages during a person's mid-20s through 30s.)*
- What can you do to help your brain improve its ability to learn skills and control emotions? *(Avoid drugs, which alter the brain's ability to learn and maintain control of emotions, even into adulthood. Repeatedly practice habits and skills that you want to strengthen.)*
- At what time in your life are you best able to learn new things? What is the scientific reason for this? *(The adolescent brain has many more synapses than the adult brain. Synapses activate connections between the different parts of the brain needed to master a skill. Adolescents' abundance of synapses allows their brains to learn new skills more easily than adults.)*

Student Work Sheet:
Students will use an alphabet code to decipher sentences. As they time how long it takes to decode each sentence, they will see how their brains begin to decipher more quickly and accurately each time.

Extension:
Have students work with partners to time each other deciphering the work-sheet codes. Then have them create their own coded sentences—some hard, some easy—and take turns timing and deciphering. Discuss why each time students decipher a sentence, it becomes easier. Some students may even be able to write sentences without looking at the code at all by the end of this exercise.

Work-Sheet Answer Key:
"Code Breaker" scrambled sentences: *1) Exercise strengthens your body and improves your mind. 2) Physical activity produces proteins that improve memory. 3) Exercise produces a brain chemical that improves mood.* "Think It Through" suggested answers: *1) Answers will vary. 2) With practice and repetition, I began to learn how to translate the code. 3) R zn z hfkvi wvxlwvi. I remembered frequently repeating letters, like vowels, because repetition strengthens corresponding synaptic connections. 4) I can practice or repeat activities that help me sharpen learning skills, which can lead to better grades. 5) I can practice pausing and thinking through decisions, instead of acting on impulse.*

Resources:
- For more teaching resources and information on drugs, visit **teens.drugabuse.gov** or **scholastic.com/headsup**.
- For immediate help with a crisis, call **1-800-273-TALK**.
- To locate a treatment center, call **1-800-662-HELP** or visit **findtreatment.samhsa.gov**.

Decision-Making Interactive Videos
teens.drugabuse.gov/peerx/choose-your-path

STUDENT WORK SHEET

Train Your Brain!

Through repetition, you can train your brain to become faster at a new skill. When you process a thought, messages are sent across connections in the brain called *synapses*. Synapses that are used repeatedly become strengthened and more productive. The exercise below will show you the effect of repetition on your brain's synapses.

Directions: Using the code breaker below, decipher each scrambled sentence and record how long it takes you to the nearest second using a clock or timer. Then answer the questions that follow.

Code Breaker

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

1. V c v i x r h v h g i v m t g s v m h b l f i y l w b z m w r n k i l e v h b l f i n r m w.

_____ _____ _____ _____ ___ _____ _____ _____.

Time it took to solve: _____

2. K s b h r x z o z x g r e r g b k i l w f x v h k i l g v r m h g s z g r n k i l e v n v n l i b.

_____ _____ _____ _____ _____ _____ _____.

Time it took to solve: _____

3. V c v i x r h v k i l w f x v h z y i z r m x s v n r x z o g s z g r n k i l e v h n l l w.

_____ _____ _ _____ _____ _____ _____.

Time it took to solve: _____

Think It Through: Write your answers on separate paper.

1. You were likely able to decode the third sentence more quickly than the first one. What was your difference in seconds?
2. If you were able to solve the third sentence more quickly, why do you think that was so?
3. Write the following sentence using the coding key above: "I am a super decoder." You may have written some of the letters in code without looking at the code breaker. Explain the brain process at work.
4. How can you use this knowledge of how your brain works to improve your grades?
5. How can you use this knowledge to improve your ability to stop and think before making a decision?