Expository Performance Task: Memory Training

Student Directions

Task:

Your class is studying about the human nervous system and the brain. You are given three articles about the brain and how it impacts memory.

*Read the sources carefully to **write an explanatory article** about improving memory. Using more than one source, select the most relevant information to support your thesis/controlling idea about memory.*

Sources for Performance Task:

Source #1

Read the article about memory from a popular science website for kids.

How Do We Remember?

You need to go to the store and pick up milk, eggs, butter, and bread. You repeat the list of foods over and over on the way to the store. When you arrive at the store, you collect the milk, eggs, bread, and . . . What was the other thing? How did you already forget the other item that was on your mental list? How does your memory work, and why does it let you down sometimes?

When most people refer to memory, they think of it as one part of the brain. The truth is your memory isn't one particular part of your brain. Memory involves several parts of your brain working together. It is a concept. It is the idea of remembering.

Formerly, scientists used to describe memory as a miniature filing cabinet full of many files that contained memories. Others described memory as a tiny supercomputer located in the brain. Today, scientists believe that memory is much more complicated than that.

How Memory Works

Memories begin as a result of the senses. The memory is then encoded, or stored, in your brain with electrical impulses and chemicals. Your brain is full of nerve cells. There are electrical pulses carrying messages from one cell to another. The electrical pulses trigger chemical messengers to be released. The chemical messengers are called neurotransmitters. The connection that is made between the cells isn't necessarily permanent. It is changing all of the time. Brain cells work together as a team, organizing themselves into groups. The groups specialize in different kinds of information processing. Each time one cell sends a message to another, the connection between those two cells gets stronger. With each new experience your brain changes a little. If you keep using your brain the same way over and over again, it shapes how your brain will be organized.

Types of Memory

There are three types of memory: sensory memory, short-term memory, and long-term memory.

Sensory memory hangs on to information for a very short period of time, only a second or two. When you look at a picture of a beautiful landscape, an almost exact image of that landscape is stored momentarily in your visual sensory memory. Your visual sensory memory requires your eyes and parts of your brain to work together. Unless you make an active effort to think about the landscape the image will quickly fade.

Short-term memory stores what you are actively thinking about at any given moment. Your short-term memory is able to hold on to information for as long as you are thinking about it. You use your short-term memory to remember the list of things your mom wants you to pick up at the store. If you continually repeat this information to yourself, you can remember it, but the moment you start thinking about something else, like where in the store the milk is located, the list of groceries will only stick around for about 20 or 30 seconds.

Long-term memory stores information, experiences, and ideas long after you stop thinking about them. When you consciously process information, short-term and long-term memory work together. For example, when you think or solve problems, the short-term and long-term memory systems are working together. Long-term memory includes an enormous amount of information. Some of this information is there for a lifetime. Scientists believe that over the course of a lifetime, the long-term memory has stored vast amounts of information. Much more than an encyclopedia!

Forgetting

As time passes, memory fades or we forget all of the specific details. An hour after you read a book, you can remember most of what it was about. Two days later, you might recall only a bit of the information that was in the book. After a month has passed, you probably remember even less.

There are several explanations as to why we may forget things. Maybe the information was not encoded in our memory properly. For instance, while reading over your notes for the test you were trying to watch your favorite show on television. This type of distraction can really interfere in encoding memories and the information is not successfully saved in your memory.

Alternatively, another reason that you may not be able to remember something is not because you actually have forgotten the information. The problem could be that you are having trouble retrieving it from your memory. You can't remember the answer to write it down on the test. It is right there, you know the answer, but it just won't come to you. As soon as the test is over and you walk out of the classroom, there it is——that answer you were trying so hard to come up with. This is a problem with retrieval. Your brain is having trouble locating that information again. It is similar to looking for a small object inside a room that is full of stuff. It can be very frustrating!

References

Loftus, E.F. (2013). Memory. *World Book Advanced*. Retrieved from http://www.worldbookonline.com/advanced/printarticle?id=ar354840

Mohs, R.C. (2007, May 8). How human memory works. *HowStuffWorks.com*. Retrieved from http://science.howstuffworks.com/life/inside-the-mind/human-brain/human-memory.htm

Source #2

Read the article about people who participate in memory championships from a 2012 issue of *Appleseeds* magazine.

Memory Masters

by Alice Andre-Clark

Nelson Dellis can look at a deck of cards for 5 minutes and then tell you the order of every single card in 63 seconds.

If you give teenager Sophia Hu a list of random words and let her study it for just 15 minutes, she might remember as many as 120 words.

Dellis and Hu were contestants in the USA Memory Championship, which has been crowning our top "mental athletes" since 1997. At the Memory Championship you start by studying the pictures of 117 strangers for 15 minutes, then try to remember all their names. In 2010, Hannan Khan listed 159 first and last names. Later, try meeting five guests at a pretend tea party and see if you can later recall their names, addresses, pets' names, hobbies, favorite foods, and more.

Think you have a knack for numbers? Try memorizing a sheet of 500 digits. It'll be tough to beat Dellis, who once remembered 248 numbers after only 5 minutes of studying.

Most of our top mental athletes say they weren't born with amazing memories. Brain scientists agree that there's probably nothing physically unusual about the brains of memory champions. They just happen to know a few tricks for keeping a lot of facts in their minds at once. . . .

Building a Memory Palace

Memories get stronger if you associate them with a place. To remember your shopping list, build it a "memory palace." Picture a building you know well, perhaps your own house. Now imagine each item in a different part of the house. Marshmallows strung like pearls, dangling from your mom's jewelry drawer. A graham-cracker fan on the coffee table. Chocolate bars popping out of the toaster.

Person + Action + Object = ? Need to memorize a long string of numbers? Start by thinking of a person, an action, and an object for each number from 0000 to 99.99. . . .

Now you're ready to learn a bigger number. For 872,936, combine the person from 87 with the action from 29 and the object from 36. . . .

What's in a Name? A Picture

Names can be hard to recall. Words like "mirror" and "table" may bring up lots of memories, but the first time you meet a Peyton or a Mrs. Cohen, you might not associate those words with anything. Change names just a little, and Cohen becomes "cold hen," an unhappy chicken sitting on a nest filled with ice cubes.

Use pictures to match faces with names too. If Mrs. Cohen has curly red hair, give the hen some fluffy red feathers. Long-necked Peyton ("pay ten") could become a stretched-out ten-dollar bill. Soon you'll rarely forget a name.

Andre-Clark, Alice. (2012, July/August). Memory Masters. *Appleseeds*, pp. 8-11.

Source #3

Read the article about interpreters and memory from a 2008 issue of *Odyssey* magazine.

Interpreters: Silver-Tongued Masters of Memory

by Charles Capaldi

Today, Murielle Pérégovoy sits in a glass-enclosed booth. An ultra-light headset rests on her ears. A microphone hovers in mid-air, inches from her mouth. Pérégovoy doesn't see any of it. Her attention is riveted on the space between her ears, which is currently filled with short bursts of angry Russian from a participant who has the floor on the other side of the conference room. Her voice rises and falls to match that of the speaker, filling the booth and the headsets of everyone tuned to the French channel. The participant finishes speaking and sits down. Murielle finishes one sentence behind him and reaches out to turn off her microphone. On any given day, she could be the voice of an ambassador, a distraught mother in war-torn Iraq, or an orthopedic surgeon. Pérégovoy is a simultaneous interpreter, and her workday has just ended.

In addition to knowing their native languages, professional interpreters are expected to understand two or more languages as well as any educated native speaker. More than 50 percent of the world's population is *bilingual* (speaks(speaks a second language from early infancy),infancy), and many bilingual people are drawn to the field.

By the age of two, most children have a vocabulary of about 2,000 words. The average American high school graduate has a vocabulary of about 50,000 words. A bilingual high school graduate can possess a vocabulary twice that size, split across two languages. Imagine the vast vocabulary stored in the long-term memory of an interpreter. Interpreters, then, seem to have amazing memories. But do they really? Questions like this one keep neuroscientists up late at night.

One of these neuroscientists is Dr. Michel Paradis, who teaches at McGill University in Montreal, Canada, and researches aphasia in bilingual people. *Aphasia* (the inability to understand or use language) usually results from a traumatic brain injury such as a stroke or accident. In the course of his research, Paradis has learned a lot about memory and language in people who are not aphasic. So, when asked whether interpreters have

better memories than average, he says, "In the same way that the term intelligence covers many different types of capabilities, memory is an umbrella term that refers to many different kinds of capacity."

"Much of an interpreter's brain power is devoted to keeping information in short-term memory," says Paradis. "Simultaneously listening in one language and speaking in another makes the task much more challenging." How then does Murielle's brain undertake this seemingly impossible task?

As the message flows through her headphones, Pérégovoy must decode it. Decoding does not mean knowing what each word means. Interpretation focuses on the message being conveyed, rather than the words used to convey it. Understanding the speech flowing through her headset requires the use of procedural (a(a type of non-declarative)non-declarative) memory—the kind of memory we use for automated tasks, skills, and habits. The interpreter knows the language of the speaker well enough to understand it effortlessly. Similarly, when you hear an utterance in English you probably aren't even aware of trying to understand it. The fact that you comprehend it subconsciously is the hallmark of procedural memory.

Once Pérégovoy's brain has decoded the message, it identifies blocks of information that should be stored for later use. This identification process is a conscious activity. Murielle's memory clings to facts, events, people, and objects, relying on what neuroscientists call declarative memory. Where procedural memory is subconscious, declarative memory requires effort and focused attention.

Murielle stores the decoded message in her short-term memory and holds it there until it has been correctly translated. She must retrieve the information and compare it to her translation before uttering a single word into the microphone. This step involves working memory. Think of working memory as a tub being filled with water and drained simultaneously. Water cannot flow into the tub at a faster rate than water drains from the tub or else the tub will overflow.

While all this is happening in Pérégovoy's brain, the speaker continues talking. The average person speaks at 120 words per minute, with bursts that reach 180 words per minute. Neuroscientists have identified that working memory has about 10 seconds (or 20 words) of storage capacity. As new information is continually added to the tub, previously stored information is constantly being compared to the memory store, putting an extra burden on working memory.

For instance, Dr. Franco Fabbro at the University of Udine in Italy found that advanced interpreting students remembered fewer details of a story when they were asked to interpret it than when they just listened to it. Other studies show that sign language interpreters have better recall than interpreters of spoken languages. Sign language interpreters undertake the same process of decoding and encoding the message in another language, but sign language does not require them to speak their translation. Instead, they deliver the message through their hands and upper bodies. Dr. Fabbro and his colleagues reasoned that the demand on interpreters to speak and listen simultaneously might be at the root of the memory interference. To test this hypothesis, he asked the students to listen to another set of stories and told them not to interpret, but to keep repeating "the . . . the . . . the. . ." while they listened. He found that these students remembered fewer

details than when just listening to the stories. Working memory is taxed by the need to listen and speak at the same time, and when working memory is burdened, memorizing information becomes more difficult.

Interpreters may start out with the same three pounds of gray matter that everyone else has, but they have trained their short-term memory to help perform a particular task. Not everyone with a three-pound brain will have what it takes to become an interpreter, in much the same way that not everyone with a good pair of lungs and a love of music will grow up to become an opera singer. A lot depends on how you train, how committed you are, and your natural inclinations. "You can be good at one type of memory and poor at another," Paradis explains. "But you can improve each type of memory with practice. If you want to increase your memory, EXERCISE IT! Do interpreters have better memories than the average person? Probably not better—just more buff.

Sweating to the Oldies? A Short-Term Memory Workout

Student interpreters often begin their studies with short-term memory workouts, called "lag exercises," which also teach them to listen and speak at the same time.

Record the following list of words into a tape recorder, or have a friend read them to you at a slow, steady pace. Leave a gap between one word and the next by reading one word every two seconds (approximately 30 words per minute).

Play the tape, or have your friend start reading. Listen to the first word. When you hear the second word, cover it up by saying the first word. You'll be saying "tree" as you hear the word "car." Be careful not to speak in the gap between words—it's important to be speaking and listening at the same time. Student interpreters often practice this exercise in the same language until they can maintain a seven-word lag.

tool	house
burp	computer
box	scratch
smooth	look
letter	lunch
pretty	pet
write	type
hello	table
lady	game
groove	bowl
tongue	dream
talk	breakfast

Capaldi, C. (2008, May/June). Silver-Tongued Masters of Memory. *Odyssey Adventures in Science*, pp. 30-33.