

Information Processing Part II: What are Some Elaborative Rehearsal Strategies That will Transfer Learning into Long-term Memory?



In one of my former articles, [How do we learn? How is Information Stored in Long-term Memory](#), I mentioned the importance of using elaborative rehearsal strategies to help transfer the information into long term memory. Using the following strategies will increase the chances that the data will be stored and retrieved when requested (Wolfe, 2010). The following is a list (with additional examples) from [Dr. Pat Wolfe's](#) workshop, The Neuroscience of Teaching and Learning presented at Nova Southeastern University in Orlando, Florida. (Wolfe, 2018)

Reciprocal Teaching

After getting the students into pairs, have one teach their partner what they had just learned. One is acting as the teacher, while the other is the student and pretends they know nothing about the subject. Then they switch roles. This is one of the most effective teaching strategies because it activates more regions of the brain allowing a greater possibility of retrieving the material. (For a more detailed description of this strategy, refer to my article, [Why is Reciprocal Teaching a High Impact Method of Instruction? Part I and Part II.](#)) It's important for the teacher to monitor the activity to be sure they truly understand what has been taught.

It should also be noted in his synthesis of over 800 meta-analyses, [John Hattie](#) reported that one of the highest rated strategies was using reciprocal teaching. Anything over .40 showed significant promise in improving student achievement. Reciprocal teaching scored a high $d = .74$. (For a further explanation of Hattie's scoring, see my article [What does Research tell us About the Importance of Teacher-Student Relationships?](#))

Priming the Mind

When a person enters a shopping mall, looking for a certain store, the first thing he/she does is head for a mall map. After they spot the store they're looking for, they look for the "You are Here" icon. Then they plan their route to get to the store.

The human brain reacts the same way. It is constantly searching for where it is and where it is headed. Before reading a chapter in social studies, for example, note the title and all the bold print. "What do you think this chapter is about?" Next, read the questions at the end. This primes the mind so when the student is reading the text, it recognizes the sections that contain the answers to the questions at the end of the chapter.

Storytelling

One of the oldest forms of instruction is story telling. Long before there were written words, people told stories to pass on (Widrich, 2012) their heritage through spoken language. People have communicated with each other through stories and are considered a powerful means for increasing retention and transfer as a teaching strategy (Widrich, L., 2012; Denning, 2004).

Jennifer Aaker, a professor at Stanford University states, “Research shows our brains are not hard-wired to understand logic or retain facts for very long. Our brains are wired to understand and retain stories. A story is a journey that moves the listener, and when the listener goes on that journey they feel different and the result is persuasion and sometimes action” (Rush, 2014).

Variety of Colors

The brain stores information according to its senses. But it also stores information in color. While working on my doctoral dissertation, I conducted a study with third and fourth graders regarding taking classroom notes using [Mind Mapping](#) (drawing small pictures instead of writing words). As I questioned the students about their lessons, they could easily describe the lesson content because of the pictures and the colors in their notes.

For example, when I asked one student if he could recall something about the lesson he said, “Well, it was about algae blooms. When the algae grows too much, it eats up all the oxygen and the fish can’t breathe so they die. I can see the orange fish lying on its side...dead. Wow! I can see the orange fish in my mind!”

Teachers have known the power of using color in their lessons. They should require students to take notes in four different colored pens. Don’t use more than four colors because the brain can easily manage organizing items into just four categories. For example, when taking notes in Spanish, put all the nouns in red, all the verbs in blue, and so forth. When it’s time for the test the words will appear in the student’s mind’s eye in color.

Hands-on-activities

A study from Stanford University indicates that students learn best by doing hand-on projects before watching online videos or reading texts. Blikstein, an assistant professor of education, “We are showing that exploration, inquiry and problem solving are not just ‘nice to have’ things in the classroomThey are powerful learning mechanisms that increase performance by every measure we have” (Plotnikoff, 2013).

Roy Pea, a Stanford professor of education, states that teachers should first have the students engage their prior knowledge and intuitions to investigate problems in a certain learning domain. Then abstracted knowledge should be introduced. Pea feels this method creates a knowledge-building relevance to watching a video or reading a text. (Plotnikoff, 2013).

Metaphors, Similes and Analogies

Linking new information to information that has been previously stored, increases the probability that students will understand and remember what is taught. In the [metaphor](#), “In capitalism, money is the life blood of society but charity is the soul,” helps students have a deeper understanding of how capitalism is defined. In the [simile](#), “The snowman was as tall as a giraffe,” helps a student visualize that the snowman was extremely

tall...since the child had seen and understood what a giraffe looked like. While the [analogy](#), “The movie was a roller coaster ride of emotions.” is a good example for students to relate to since most of them have been on a roller coaster and understand that the movie had emotional highs and lows, as well as twists and turns.

Reflect and Write

Giving time to write and reflect about what they have learned, helps them organize their thought and gives them practice expressing what they have learned. This also allows the teacher to determine whether they understand the lesson. The instructor could also ask them to complete a sentence or two, such as, “The most important thing I learned today was _____” or , “Something that was easy (or difficult) for me in today’s lesson was _____” (Wolfe, 2010).

Problem-Based and Project-Based Learning

In order for transfer to occur, students need to practice applying their skills in real-life situations. When learning fractions for example, having the students bake cookies will allow them to manipulate the ingredients by cutting the recipe in half. This type of elaborate rehearsal not only helps with encoding memory but shows the students how to apply what they have learned into real-life situations (MIT News, 1996).

[Hattie’s research](#) noted that using problem-solving and project-based learning scored $d = 0.61$, indicating that this strategy has a strong the correlation to student achievement (Hattie, 2009).

Visuals and Graphics, Patterns, Maps and Graphic Organizers

“The eyes have nearly 70% of the body’s sensory receptors” making visual information so much easier to retrieve (Wolfe, 2010). The brain will remember a picture quicker than it will remember words (MIT News, 1996). This is why drawing pictures, using graphic organizers and creating maps are an excellent tools to use in the classroom.

Remembering that any score of over $d = 0.4$ indicates a high correlation to student achievement, Hattie noted that concept mapping had a score of $d = .57$ (Hattie, 2009).

Mnemonics



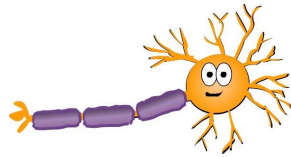
In ancient times, the Greeks used mnemonics to help them remember information. If a student is trying to memorize the four major lobes of the brain for example, the student takes the first initial of each word and then makes up some crazy sentence using those letters. The lobes are [Frontal](#), [Parietal](#), [Temporal](#), and [Occipital](#). Taking the first letters, f,p,t, and o, and then make up a sentence such as, “Funny people toss oranges.” Since it’s easier to remember this silly sentence, the student can recall the sentence, take the first initial of each word which will act as a trigger to help them remember the lobes of the brain.

Music, Rhyme, Rhythm and Rap

We can easily remember things that are set to rhyme such as “In 1492 Columbus sailed the ocean blue.” We teach children the alphabet by singing it to them. Students can take a concept and put it to their own song or rap. In Dr. Wolfe’s workshop, we were asked to create a rhyme or song using something we learned in our workshop, The Neuroscience of Teaching and Learning.

Using the song, “I’m a Little Teapot,” our committee created the following;

I’m a little neuron,
Axon out ...
Here are my dendrites,
Watch them sprout.
When I make connections,
You can count ..
Over 6,000 without a doubt!



Conclusion:

The main purpose of any lesson is to get information into long-term memory so it makes sense, is meaningful, and can be recalled when needed. When a student can transfer their knowledge and apply it to new concepts and situations, then teachers realize that they’ve reached their goal. Using elaborate rehearsal strategies will help transfer what the students are learning into their long-term memory.

For comments and/or questions, please don’t hesitate to contact me at
DrLou@meteorededucation.com
lwhitaker@meteorededucation.com

Lou Whitaker, Ed. D.
Brain Junkie



Bibliography

Denning, S. (2005). The leaders guide to storytelling. San Francisco, CA: Jossey-Bass.

Hattie, J. (2009). Visible learning; A synthesis of over 800 meta-analyses relating to achievement. Routledge: NY, NY.

Kaye, B. &. (2005, May 31). True tales and tall tales the power of organizational storytelling. Training and Development.

MIT News. (1996, December 19). MIT Research - Brain processing of visual information. Retrieved from MIT News: <http://news.mit.edu/1996/visualprocessing>

- Plotnikoff, D. (2013, July 16). Classes should do hands-on exercises before reading and video, Stanford researchers say. Retrieved from Stanford News:
<https://news.stanford.edu/news/2013/july/flipped-learning-model-071613.html>
- Rush, B. (2014, August 04). The Guardian. Retrieved from Science of storytelling: why and how to use it in your marketing: <https://www.theguardian.com/media-network/media-network-blog/2014/aug/28/science-storytelling-digital-marketing>
- Widrich, L. (2012, December 05). Lifehacker. Retrieved from The science of storytelling: Why telling a story is the most powerful way to activate the brain:
<https://lifehacker.com/5965703/the-science-of-storytelling-why-telling-a-story-is-the-most-powerful-way-to-activate-our-brains>
- Wolfe, P. (2010). The brain-compatible classroom: A teacher's guide. Port Chester, NY, USA: National Professional Resources, Inc.
- Wolfe, P. (2018). The neuroscience of teaching and learning: A training the trainers manual. Napa, CA: Dr. Pat Wolfe.