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1. Mnemonics as Tools to Aid Memory

How do you remember the number of days in a month, the order of the colors of the visible spectrum, or the names of the lines on the treble clef? You probably use a memory aid called a mnemonic device or strategy—a method for organizing information in a way that makes it more likely to be remembered. The term *mnemonic* comes from the Greek word *mnema*, meaning memory. Mnemonics have a long, rich history. Ancient Greeks used them extensively and considered mnemonics a true rigorous art requiring imagination, effort, and a good mind. They considered the study of mnemonics an essential element of a classical education. (This made sense in a culture where stone or clay

Today, however, the topic of mnemonics is rarely discussed in educational journals or even among teachers. The reason for this avoidance is that, given the emphasis on learning through relevancy and meaningfulness, many teachers view mnemonics as mere memorization or "memory tricks." Many educators consider mnemonics as intellectually unrespectable because they do little to enhance meaningful understanding. The truth, however, is that mnemonics can be effective learning strategies. We can use them successfully to help students recall the meaning of terms, dates, and facts they need to know: foreign language vocabulary, scientific and mathematical terminology, music notation, the chronology of historical events, and factual information in many other subject areas. Contrary to what many people believe, mnemonic strategies do not foster simple rote memory at the expense of comprehension and problem solving. In fact, available research evidence suggests that using mnemonic strategies to acquire factual information can often improve students' ability to apply the information (Levin & Levin, 1990).

Why Mnemonics Work

Mnemonics are based on the principle that the brain is a pattern-seeking device, always looking for associations between the information it is receiving and what is already stored. If the brain can find no link or association, it is highly unlikely that the information will be stored in long-term memory. Unfortunately, this scenario is relatively commonplace in the classroom. We require students to remember a considerable body of material that has little or no inherent meaning, such as letters of the alphabet or the items that make up a classification system. For these types of information, mnemonic strategies are extremely effective. They create links or associations that give the brain an organizational framework on which to hook new information. The process is relatively simple and consists of three basic steps:

1. The student has—or is given—a framework.
2. New items are associated with the framework.
3. The known cues—the framework—aid in the recall of the new information.

For example, suppose the teacher wants her students to remember the order of the colors of the visible spectrum. Since there doesn't appear to be any reason the order is red, orange, yellow, green, blue, indigo, and violet, it would be difficult to remember. However, if the teacher introduces the students to a fictitious person, Roy G. Biv, and explains that the letters of his name each stand for the first letter of the colors in the spectrum, she provides a framework that makes the information easier to learn and more likely to be readily recalled. In this case, the teacher provided the students with the mnemonic framework. Later, students generate their own frameworks for other pieces of knowledge, which are often more meaningful and therefore more powerful as a memory tool.

Types of Mnemonic Strategies

Mnemonics encompass a broad range of categories, some more familiar than others. One of the most common is the acrostic sentence. If you took music lessons as a child, you probably learned the notes of the lines on the treble clef by repeating the sentence, "Every good boy does fine." The first letter of each word is the note on one of the lines, and the order of the sentence is the order of the lines from the bottom to the top of the staff. Other familiar acrostic sentences are "My very eager mother just served us nine pizzas," which gives the order of the planets from the sun outward (Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto); "In Persia, men are tall," for

anaphase, telophase); "All hairy men will buy razors," for the constituents of soil (air, humus, mineral salts, water, bacteria, rock particles); and "Kids prefer cheese over fried green spinach," the zoological classifications in descending order (kingdom, phylum, class, order, family, genus, and species). One 2nd grade student explained to his teacher that the directions, north, east, south, and west, are easy to remember if you say, "Never eat slimy worms." Incidentally, if you'd like to remember how to spell mnemonics, you might remember that "Mnemonics neatly eliminate man's only nemesis, insufficient cerebral storage."

Acronyms are similar to acrostic sentences, except that they use single words rather than sentences. If students have difficulty remembering when to use "affect" versus "effect," they will probably benefit from the acronym RAVEN, which stands for "Remember affect (is a) verb, effect (is a) noun." The name "McHale" will help students remember the forms of energy: mechanical, chemical, heat, atomic, light, and electrical. An acronym for the names of the great lakes is HOMES: Huron, Ontario, Michigan, Erie, and Superior.

Many mnemonics take the form of rhymes and phrases. Probably the best-known rhymes are "I before E except after C, or when rhyming with A, as in neighbor and weigh" and "Thirty days hath September, April, June, and November." Most elementary teachers use the rhyme, "When two vowels go walking, the first one does the talking," to help students remember when a vowel is not pronounced. Many a chemistry student knows the rhyme, "May her rest be long and placid; she added water to acid. The other girl did what she oughter; she added acid to water." Reading Roman numerals is easier if you learned the rhyme, "X shall stand for playmates ten; V for five stalwart men; I for one as I'm alive; C for a hundred, D for five (hundred); M for a thousand soldiers true; and L for fifty, I'll tell you."

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Mnemonic phrases are used primarily for assistance in remembering which spelling to use for homonyms or other words that are easily confused. To recall, for example, when to use "principle" versus "principal," students can be taught to remember that "The principal is your pal." Other phrases help with words often misused or misspelled, such as "Dessert is bigger in the middle, just like you'll be if you eat too much of it," or "Miss Pell never misspells," or "Stationery goes in envelopes," or "There's a rat in separate." An excellent resource for spelling and vocabulary mnemonics is *Vocabutoons (Vocabulary Cartoons)* by Sam Burchers (1997).

When you recall how powerful visuals are for storing and recalling information, it isn't surprising that they play a role in many mnemonic strategies. *Keyword mnemonics* comprise one of the few mnemonic strategies that have been the subject of numerous research studies. Using keywords involves associating two items using mental imagery and is often employed in the study of new vocabulary. For example, suppose you are taking a class in Spanish and need to memorize a vocabulary list by the next class. You could say the words over and over (rote rehearsal), hoping they eventually stick in your brain, or perhaps you might make flash cards with the Spanish word on one side and its English equivalent on the other, and use them to try to remember the meanings. If you had learned how to use keyword mnemonics, however, you would take each Spanish word and select a concrete noun in English that sounds like that word. For the word "carta" (letter), you might imagine a large grocery cart and picture a giant letter in the cart; or for the word "pato" (duck), you could picture a duck with a pot on its head.

Research on the keyword method, conducted by Pressley and Levin in 1978, produced impressive results. Using this strategy, 5th graders recalled twice as many foreign words as children of comparable age and ability who were left to learn the words on

their own. Further research found that the keyword mnemonic strategy was successful when extended to other areas, such as abstract prose. When the investigators tested students after a period of time, they maintained their gains, suggesting that keyword mnemonic strategies have a lasting effect (Joyce & Showers, 1988; Pressley & Levin, 1978).

Loci mnemonics also use links or associations to create memory hooks, but rather than linking a word to an image, this strategy links words to physical locations that are already firmly established in memory. (*Loci* is Latin for "places.") Cicero and other orators of the Classical Era used this method to remember the content and order of their speeches. In loci mnemonics, you take a mental walk through a familiar place, such as your house, and visualize the items to be remembered in various locations in your house. As with all imagery, it helps to make the images vivid by exaggerating their size, making them animated, or changing their color. When you need to recall the list, you take another walk through the house and "see" the items in the order you placed them.

Narrative chaining is closely related to loci mnemonics and involves weaving items to be remembered into a story framework. As an example, groups of students in a civics class created a narrative to help them remember the freedoms listed in the First Amendments to the Constitution: the freedoms of religion, speech, the press, and assembly, and the right to bear arms. One narrative imagined a large group of people marching through the town and eventually assembling in front of a large cathedral. They strung cables, set up microphones, and began giving speeches about their right to have guns to protect themselves. Many members of the press arrived and began taking photographs and videotaping interviews with members of the group.

The narrative-chaining method has been shown [illegible] far superior to ordinary rote memorization, in which sub[illegible]s try to

remember without aid. Researchers Bower and Clark instructed subjects to learn 12 different lists of 10 unrelated words. Some subjects made up a story linking together the words in each list. The students in the control group studied the words without the aid of this technique. Students who used the narrative-chaining mnemonic strategy later recalled more than 90 percent of the 120 words, whereas the control group remembered only 13 percent (McGee & Wilson, 1984).

Teaching Mnemonic Strategies

Research indicates that students' performance on memory tasks is related to age. Immature learners (including children with mental retardation and learning disabilities) are most likely to have problems with memory tasks and, therefore, to have a greater risk of experiencing learning difficulties (Pressley & Levin, 1987). Throughout the elementary school years, students progressively perform better on memory tests, but they do not spontaneously produce memory strategies at times when such strategies would be useful—until around age 10. At about 5th grade, students begin to demonstrate a more efficient use of memory strategies (Moely et al., 1969).

Researchers have also shown that higher-achieving students of all ages are more likely to be able to invent effective learning strategies on their own, whereas lower-achieving students or students with learning disabilities are less likely to do so. Immature students, however, and those who generally are not successful learners, can be taught to use efficient strategies through demonstration and numerous opportunities to practice. Even a common memory technique such as repeating information to yourself is probably learned by example rather than developed spontaneously. Where do children learn these skills? Evidence indicates that the classroom plays an important role (Moely et al., 1969). Teachers can help students understand how their memories work,

demonstrate various mnemonic devices, and provide prompts for when to use these strategies. When students know appropriate strategies and how to use them, they are much more likely to make "informed" judgments about when to use them.

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