

What is it?

Mnemonics devices are structured ways to help people remember and recall information. Mnemonic instruction combines presentation of important information with explicit strategies for recall. It is most commonly employed in areas where individuals are required to recall large amounts of unfamiliar information or to make associations between two or more units of information at recall. Mnemonics can be applied to any domain requiring recall of information.

GO FOR IT

For whom is it intended?

Mnemonics can be used with students across a wide age range (Levin, 1993). Though younger students are usually not required to learn and recall the large amounts of facts that are required of older students, associations linking the letter "A" to "apple" or the letter "G" to "glasses" employ mnemonic principles. The procedure has been well researched and validated for students with high-incidence disabilities, particularly students with learning disabilities, as well as for typical students at all levels of education.

How does it work?

Most recall tasks involve organizing and associating information relative to some sort of prompt, such as an exam question. Mnemonics provide cognitive tools to help individuals make these associations. Some basic principles of cognitive psychology help to explain how mnemonics work (Finke, 1989).

Mnemonic techniques vary in complexity from those that are extremely simple to some that are quite complex. The trick to good mnemonic encoding is picking the right mnemonic tool for the job. A variety of mnemonic tools are described in the following sections, along with suggestions about their best uses. Most often, mnemonic strategies rely on both verbal and imagery components to support recall. The first three strategies may be used in verbal mode alone but may also be encoded with imagery; the remaining strategies rely quite heavily on supportive imagery.

First letter mnemonics, acronyms, and acrostics. First letter mnemonics and acronyms use the first let-

ter of each word or phrase to be remembered to make a meaningful word or phrase. Each letter of the phrase then stands for one feature of the to-be-recalled information. Common examples of these techniques are "Homes" (for the names of the Great Lakes: Huron, Ontario, Michigan, Erie, Superior) and STAB (the four common voices in a chorus: soprano, tenor, alto, and bass).

Acrostics support recall by creating an entire sentence with the first letter of each word to be remembered. For example, the names of the lines in the treble clef correspond to the first letter of each word in the sentence "Every good boy deserves fudge." Similarly, Mastropieri and Scruggs (1991) suggested the sentence "George's elderly old grandfather rode a pig home yesterday" to recall the spelling for the word "geography."

The first letter strategy organizes the information into meaningful chunks and provides cues to help the student recall the target information. The cues provided by the first letter are, however, minimal and may not be sufficient to help some learners. Additionally, the target information must already be familiar and meaningful to the learner. Therefore, the acrostic "Ten Zebras Bought My Car" would be of little benefit to a student attempting to recall the names of the branches of the facial nerve (Temporal, Zygomatic, Buccal, Masseteric, Cervical) unless the student was already quite familiar with the terminology. Keywords (discussed later) may be preferable to acrostics and acronyms when the to-be-recalled material is unfamiliar.

Pegwords. The Pegword strategy can be used when the order of information is important or when the to-be-recalled information involves numbers. Pegwords are short words that sound like numbers and are easy to picture (see Table 1). Mastropieri and Scruggs (1991) provided an example of pegwords to recall the reasons for dinosaur extinction in decreasing order of plausibility. Reason number two was that the swamps may have dried up. This fact and its plausibility ranking were represented through a drawing of a dinosaur wearing shoes (pegword for two) and walking past a sign that said "Dry Swamp." At the time of recall, the learner recalls either the dry swamp or the dinosaur wearing shoes and then reports the other part of the image. Thus, a learner may think, "I remember a pic-

ture of a dinosaur wearing shoes, what was he doing? OK, walking past a dry swamp, so reason number two is the swamps dried up.”

Table 1
Pegwords for Selected Numbers

Number	Pegword	Number	Pegword
One	Bun, gun, sun	Eleven	Lever
Two	Shoe	Twelve	Elf
Three	Tree	Thirteen	Thirsting
Four	Door, floor	Fourteen	Forking
Twenty	Twinty, Plenty	Sixty	Witchy
Thirty	Dirty	Seventy	Heavenly
Forty	Warty	Eighty	Weighty

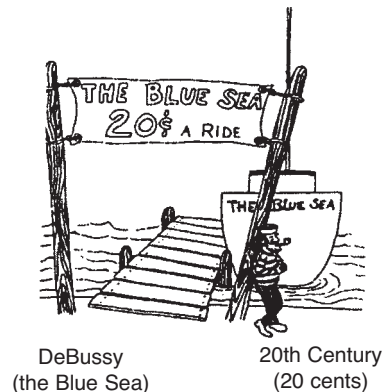
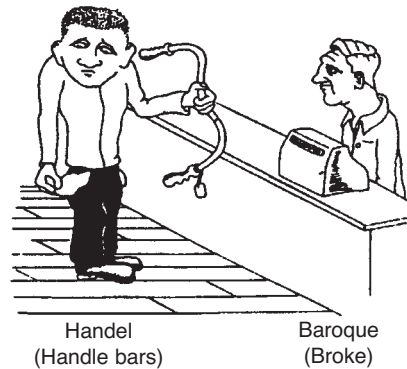
One advantage of the pegword system is that it provides direct access to numerical-order information. For instance, a person learning by the pegword system can directly recall in isolation that the thirty-second president was Truman (imagine a “treeman” wearing “dirty shoes”). Sometimes, failure to recall a link early in the chain of information leads to the loss of all or much of the subsequent information. Pegwords reduce such memory decay because pictorial representations are assigned to numbers.

Keywords. Of all the mnemonic procedures, the Keyword strategy is the most thoroughly researched. Mastropieri and Scruggs (1991) describe three steps involved in the use of the keyword mnemonic method:

- Reconstruct the term to be learned into an acoustically similar, already familiar, and easily pictured concrete term - select a keyword.
- Relate the keyword to the to-be-learned information in an interactive picture, image, or sentence.
- Retrieve the appropriate response by thinking of the keyword, the picture, and what was happening in the picture. State the information.
- For example, Brigham & Brigham (1998) encoded the names of various composers and the musical periods in which they wrote with keywords (see Table 2 & Figure 1). Students who were provided with the keywords and illustrations recalled significantly and substantially more composers and the periods in which they wrote at both an immediate

and delayed recall test. Further, the students reported that they liked the keyword approach.

Figure 1
Examples of Pictures Associated with Keywords



Keywords have had a multitude of applications in the special education literature and have been shown to be effective across a wide range of subject areas (Espin & Foegen, 1996; Scruggs & Mastropieri, 1992; Swanson, 1999). They have been used to teach factual historical information (e.g., Thomas Paine wrote Common Sense), scientific vocabulary (e.g., “paleo” means old), and the names and characteristics of minerals. In addition, keywords have also been shown to increase the ability of students with high-incidence disabilities to remember main ideas when reading in content areas (Graves & Levin, 1989).

Table 2
Keywords for Selected Musical Periods, Composers

PERIOD	KEYWORD	COMPOSER	KEYWORD	IMAGE
Baroque	broke*	Bach	box	Broke man in a box.
		Handel	handle bars	Person can't buy handle bars because “broke”
20th Century	cents	Debussy	“The Blue Sea”	Blue Seat Boat 20¢ a ride
		Copland	Soapland	“Soap: 20¢” sign on “Soapland” Laundromat
Jazz	jars	Gershwin	Good tins	Store sale: Your choice: Good tins or Great jars!
		Ellington	elephant	Elephant stacking jars

*The keyword “broke” is depicted by an individual with his or her pockets turned out.

How practical is it?

Teachers developing or searching for mnemonic materials are best advised to focus on factual material in the curriculum. Keyword mnemonics are particularly well suited to factual recall tasks and are not intended to enhance “higher-order skills” and problem-solving.

Factual information and vocabulary knowledge is extremely important in the success of students in content area classes, particularly at the secondary level (Scruggs & Mastropieri, 1992) and in performance on the types of high-stakes assessments that most states are employing in their schools (Hess & Brigham, 2000).

Keywords are very appropriate for unfamiliar and abstract vocabulary because they link the to-be-learned information with words that are acoustically similar and already known to the learner. It is important to structure the instruction to provide abundant practice and support for students developing their own mnemonics. To help students develop their own keywords, King-Sears et al. (1992) studied the effects of the IT FITS strategy on students with learning disabilities:

- Identify the term.
- Tell the definition of the term.
- Find a keyword.
- Imagine the definition doing something with the keyword.
- Think about the definition doing something with the keyword.
- Study what you imagined until you know the definition.

Using IT FITS, King-Sears et al. (1992) found similar recall of target information when comparing student-generated to teacher-provided mnemonics. However, King-Sears et al. (1992) and others (Mastropieri & Scruggs, 1991) have reported that when students generate their own strategies, instruction tends to move at a much slower rate. Because time is limited when students generate their own keywords, often less instructional material can be covered.

How effective is it?

Interventions using mnemonic instruction have produced some of the largest instructional gains recorded in the special education literature (Swanson, 1999). It should be noted, however, that the impact of

mnemonic instruction is evaluated most often with criterion-referenced tests and criterion-referenced measures. Such measures tend to yield much larger effect sizes than do norm-referenced measures; however, these are the types of measures that teacher-made tests most resemble. Still, it should be noted that mnemonic instruction has not been shown reliably to affect performances on norm-referenced tests.

What questions remain?

Mnemonic instruction is one of the most thoroughly researched interventions available for students with LD (Levin, 1993). However, several questions regarding this technique remain unanswered. To date, we do not have comprehensive data on whether mnemonic procedures have the potential to “close the gap” between the achievement of students with and without disabilities when delivered in inclusive settings. It may be that students with disabilities fail to receive mnemonic instruction with sufficient intensity to gain the full benefit of the intervention in such settings. In individual research studies, large amounts of material are conveyed using carefully controlled procedures which ensure that students receive a great deal of practice with the individual mnemonic devices.

Little is known about the effects of mnemonics with culturally and ethnically diverse students. Specifically, the important function that mnemonics serve is in linking unfamiliar material to already known and concrete materials. Students who do not share the culture of the majority of students in the classroom may not profit from the same mnemonic materials. As with any strategy, mnemonic instruction must be considered in relation to the background knowledge and capacity of the students for whom it is intended (Swanson, 1999).

Another unanswered question relative to mnemonic instruction is the degree of confusion students will find when presented with a number of mnemonic devices at once. It remains unclear how many mnemonic devices can be acquired and used in a given period of time.

Finally, more must be learned about how to ensure that the students who most need mnemonic supports will utilize, maintain, and apply the strategies independently (Scruggs & Mastropieri, 1992). The generalization of the use of mnemonics is essential for students to gain independence and to move toward independent learning. Like other effective instructional strategies for students with learning disabilities, mnemonic strategy studies have here-to-fore lacked generalization and maintenance phases that adequately inform us about those effects.

GO FOR IT



Teachers employing mnemonics should expect their students to recall substantially more target material than they would without the technique. However, they should not be surprised if their students do not recognize the need for mnemonic devices in other areas of instruction. Building in forced generalizations and applications will be essential for teaching students to utilize mnemonics in a broader context.

How do I learn more?

The following sources provide detailed discussions of mnemonic instructional materials and procedures:

- Levin, J.R. (1985). Educational applications of mnemonic pictures: Possibilities beyond your wildest imagination. In A. A. Sheikh & K. S. Sheikh (Eds.), *Imagery in education: Imagery in the educational process* (pp.63-87). Farmingdale, NY: Baywood.
- Levin, J.R. (1993). Mnemonic strategies and classroom learning: A twenty-year report card. *The Elementary School Journal*, 94(2), 235-244.
- Mastropieri, M.A. & Scruggs, T.E. (1991). *Teaching students ways to remember: Strategies for learning mnemonically*. Cambridge, MA: Brookline Press.
- Mastropieri, M.A. & Scruggs, T.E. (1993). *A practical guide for teaching science to students with special needs in inclusive settings*. Austin, TX: PRO-ED.
- Willoughby, T. & Wood, E. (1995). Mnemonic strategies. In E. Wood, V. E. Woloshyn, & T. Willoughby (Eds.) *Cognitive strategy instruction for middle and high schools* (pp. 5-17). Cambridge, MA: Brookline Press.

Other Literature cited:

- Brigham, F. J. & Brigham, M. M. (1998). Using keyword mnemonics in general music classes. *Cognitive psychology meets music history. Journal of Research and Development in Education*, 31(4), 205-213.
- Espin, C. A., & Foegen, A. (1996). Validity of general outcome measures for predicting secondary students' performance on content-area tasks. *Exceptional Children*, 62(6), 497-514.
- Finke, R. A. (1989). *Principles of mental imagery*. Cambridge, MA: MIT Press.
- Graves, A. W. & Levin, J. R. (1989). Comparison of monitoring and mnemonic text-processing strategies in learning disabled students. *Learning Disability Quarterly*, 12, 232-236.
- Hess, F. & Brigham, F. J. (2000). The promises and pitfalls of high stakes testing. *American School Board Journal*, 187(1), 26-29.
- King-Sears, M.E., Mercer, C.D., & Sindelar, P.T. (1992).

Toward independence with keyword mnemonics: A strategy for science vocabulary instruction. *Remedial and Special Education*, 13, 22-33.

- Scruggs, T. E., & Mastropieri, M. A. (1992). Classroom applications of mnemonic instruction: Acquisition, maintenance, and generalization. *Exceptional Children*, 58, 219-229.
- Swanson, H.L. (1999). *Interventions for students with learning disabilities: A meta-analysis of treatment outcomes*. New York: The Guilford Press.

About the authors

This issue of Current Practice Alerts was written by Rick and Michelle Brigham, in collaboration with the DLD/DR Current Practice Alerts Editorial Committee. Rick Brigham is an Associate Professor in the Department of Curriculum, Instruction, and Special Education at the Curry School of Education, University of Virginia. He coordinates the M.Ed. program in high-incidence disabilities at the University. Michele Brigham is choral music director and special education instructor at Western Albemarle High School. She is also an adjunct instructor in the University of Virginia teacher certification program in the University's Northern Virginia Center, Falls Church, VA. The authors would like to thank Dr. Lee Swanson for his comments on an earlier draft of this manuscript.

About the Alert Series

Current Practice Alerts is a joint publication of the Division for Learning Disabilities and the Division for Research within the Council for Exceptional Children. The series is intended to provide an authoritative resource concerning the effectiveness of current practices intended for individuals with specific learning disabilities. Each Alerts issue focuses on a single practice or family of practices that is widely used or discussed in the LD field. The Alert describes the target practice and provide a critical overview of the existing data regarding its effectiveness for individuals with learning disabilities. Practices judged by the Alerts Editorial Committee to be well validated and reliably used are featured under the rubric of Go For It. Those practices judged to have insufficient evidence of effectiveness are featured as Use Caution. For more information about the Alerts series and a cumulative list of past Alerts topics, visit the Alerts page on the CEC/DLD website: <http://dldcec.org/alerts/>

Target practices for future issues: Co-teaching, Classroom Peer Tutoring, Social Skills Training, Reading Recovery, Phonological Awareness Training.