Issue 7 Winter 2017

CORE

Academic Quarterly

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CORE Reading Expert

Advances in Reading Intervention, Part 2: Word-Level Reading

Dale Webster, Ph.D., Chief Academic Officer, CORE, Inc.

Many educators struggle to implement an RtI/MTSS model to address reading difficulties. Even with a solid RtI system in place, schools are bombarded with countless programs and strategies to address a wide range of reading difficulties that children may experience. To support a more nuanced approach to reading intervention, and to help educators sift through the multitude of options, it is helpful to characterize struggling readers according to reading profiles.

In her book *The Power of RTI and Reading Profiles*, Louise Spear-Swerling (2015) proposes reading profiles that align with the Simple View of Reading model (Gough & Tunmer, 1986). This model views reading comprehension as consisting of two overarching components: word recognition and language comprehension. Thus, students who are struggling can be categorized into three types of reading profiles: those with word recognition difficulties, those with reading comprehension difficulties, and those with a combination of the two (Spear-Swerling, 2015).

With K–2 struggling readers, many children experiencing reading difficulties are challenged by a phonological-core deficit that impacts their ability to decode and read fluently. In addition, many students who are English learners and/or students who are from lower socioeconomic environments may enter school with limited language skills that can also impact their ability to comprehend and read fluently.

Advances in Reading Intervention, Part 2: Word-Level Reading (cont.)

In grade 3 and beyond, there are still many students who struggle with fluency that may or may not stem from a phonological-core deficit. Because word reading fluency involves both lower-level phonological skills and higher-level language skills, the underlying causes of difficulties with word reading fluency gets more complicated as students get older.

What is at the core of an interventionist's work to address word-level reading difficulties? Those who have followed the *Academic Quarterly* for some time might recall our Fall 2015 issue that reviewed the book *Essentials of Assessing, Preventing, and Overcoming Reading Difficulties* by David Kilpatrick. I will draw again on the information from this book because what Kilpatrick says bears repeating.

The research is clear that we have gotten much better at improving students' word reading accuracy. However, developing word reading fluency in students who are experiencing reading difficulties still presents a challenge for reading interventionists. It goes without saying that developing automaticity with words is important for reading comprehension. A cornerstone of word reading fluency is a system the brain uses to read words called the *orthographic lexicon*. This orthographic lexicon relies on four sources of knowledge:

1. Word-specific representations (words that are recognized automatically)
2. Orthographic units, or spelling patterns seen visually (e.g., the –*tch* spelling in the word *catch* or the *ai* spelling in the word *rain*)
3. Phonological units (e.g., the sound for /ch/ or the sound for long *A*)
4. Sub-word orthographic-phonological connections (e.g., being able to automatically connect the sound for /ch/ to the spelling –*tch* or the sound for long *A* to the spelling *ai*)

A team of researchers at the Florida Center for Reading Research (FCRR) argues that our current methods of intervention fail to instill in students the "self-teaching" mechanism proposed by David Share (1995). This self-teaching mechanism allows typically developing readers to realize that a spelling's position within a word and surrounding letters affect how the spelling (orthography) and sound (phonology) interact for correct pronunciation of the word. For example, through repeated exposures, children come to realize that *gh* is pronounced differently at the beginning of a word, as in *ghost*, versus *gh* at the end of a word, as in *through* or *though*. However, children with reading difficulties are challenged to develop this self-teaching mechanism. The research is beginning to suggest that interventions should do more to help children develop this mechanism (Compton et al., 2014).

Donald Compton and his colleagues argue that current decoding interventions focus mainly on learning spelling patterns (e.g., graphemes such as *ai* or –*tch*) to apply decoding strategies which, by itself, does not develop the self-teaching mechanism in children with reading difficulties. In other words, while decoding instruction is necessary, it may not be sufficient for these children. They believe word reading interventions must also focus on mastery word learning: repeated practice with target words that provide enough exposures so that automaticity develops.

Based on previous research, these researchers believe that having a subset of words that are recognized by sight serves as an anchor for the addition of new words into the orthographic lexicon (see earlier definition). They theorize that having a subset of mastered words anchors the learning so that as children with reading difficulties read more words, they are able to induce the statistical rules of English spelling like typically developing readers. For example, the vowel pattern of *ea* when not following *r* is known to be pronounced like the long *E* sound in *meat* approximately 63% of the time, 27% of the time as the short *E* as in *threat*, and the remaining 10% as in *great* or *ocean*. Typically developing readers realize these statistics naturally, but students with reading difficulties need to have a solid foundation in sight words (words known automatically) and massive amounts of practice reading text to learn these statistics. A point of clarification is needed here. These researchers are not suggesting that we teach children to memorize words; rather, they are suggesting that through decoding instruction, time also needs to be spent helping students master words that contain the spelling patterns that have been taught.

How do interventionists assist with this mastery word learning? In addition to providing children large amounts of practice in reading connected text, other types of activities should occur, as described next.

These ideas bring us back to Kilpatrick's book. To develop word-specific representations, one must be able to read words automatically. Kilpatrick (2015) argues that orthographic mapping is the key to reading words by sight. Linnea Ehri (2014) states, "Orthographic mapping involves the formation of letter-sound connections to bond the spellings, pronunciations, and meanings of specific words in memory. It explains how children learn to read words by sight, to spell words from memory, and to acquire vocabulary words from print." Kilpatrick (2015) describes further orthographic mapping:

> ". . . the mental process readers use to store written words for later, instant retrieval. Orthographic mapping explains how students turn unfamiliar words into instantly accessible sight words, with no sounding out or guessing. This is something that weak readers do very poorly, and as a result, they have limited sight vocabularies and limited reading fluency."

According to Kilpatrick, the lynchpin of successful orthographic mapping is mastery of advanced phonemic awareness. Advanced phonemic awareness goes beyond the ability to orally blend and segment words and requires students to delete or substitute sounds at the beginning or end of words. For example, the word *speak* without the /s/ is *peak*. Even more difficult is deleting the /p/ in *speak* to obtain *seek* (remember, phonemic awareness is an oral activity, so the spelling doesn't matter in this instance). For typically developing readers, quality phonics instruction and regular reading practice during the latter part of first grade through third grade helps students naturally develop the ability to manipulate (delete and substitute) phonemes. However, for struggling readers, more explicit development of advanced phonemic awareness should occur as part of an intervention program because it is not developed naturally through phonics instruction.

Kilpatrick argues that the most successful intervention programs have three important components. These interventions

- Address phonological awareness difficulties and teach advanced phonemic awareness skills (substitution, deletion)
- Provide explicit phonic decoding instruction
- Provide sufficient opportunity to practice these skills with reading connected text

Advances in Reading Intervention, Part 2: Word-Level Reading (cont.)

This combination of intervention elements allows students to develop the capacity to quickly and reliably add words to their sight vocabularies (develop orthographic mapping), thus helping to increase the number of words read automatically and assisting with overall reading fluency. Based on the idea of mastery word learning presented previously, we now should consider adding a fourth component—one that assists students with learning a subset of words to mastery.

In his program *Equipped for Reading Success*, Kilpatrick encourages several word study activities that promote orthographic mapping (mastery word learning). Here are a few examples:

- Use look-alike words (e.g., *black*, *block*, *brick*, *brink*, *break*, *blink*) when reviewing flash cards, developing word searches, etc. This forces children to attend to every letter in the word.
- Use the "backward decoding" technique, where students sound out words from back to front, one rime unit or onset at a time. For example, for the word *sent*, cover the *s* and have students read *ent*. Then, uncover the *s* and have the students read *sent*.
- Map words by using word study questions. Have students orally segment a word before seeing its printed form (e.g., *cream* = /c/ /r/ /ea/ /m/). Then ask questions to focus students' attention on which letter or letters make a certain sound in the oral word (e.g., which letter says /r/; which letters say long *E*).
- Practice oral decoding. Spell a word aloud and have students identify the word based on its oral spelling.

These examples connect to the FCRR research in that children with reading difficulties need not only good phonics instruction, but also repeated exposure and practice with words, so that these words become automatic.

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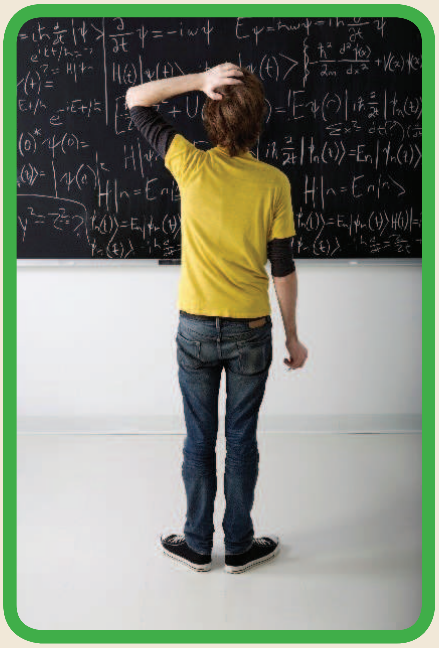
Moving Math into Long-Term Memory

by Dean Ballard, Director of Mathematics, CORE, Inc.



A common goal for student learning is to move key ideas, facts, and skills from short-term to long-term memory. But just what are the instructional strategies that do this? It turns out there are some reliable strategies that push information, experiences, and ideas into long-term memory and make these memories readily retrievable. Four key attributes can make memories permanent are rehearsal or practice, novelty, sense-making, and meaningfulness. Questions we should ask are which of these can or cannot be used in classroom instruction, are all or any of these attributes necessary, are all or any of these sufficient, and is there a magic combination—a silver bullet, if you will—or can any combination work?

Practice

Practice or rehearsal is a time-honored method for helping to make knowledge and skills permanent. David Sousa states that "Practice may not make perfect, but it does make permanent, thereby aiding in the retention of learning" (2008). However, Sousa also cautions that it is very possible to practice the same skill repeatedly "with no increase in achievement or accuracy of application." He points out that for practice to be successful, the learner must practice with motivation, understanding, versatility of application, and the ability to analyze the process and results for correctness and improvement.

Research indicates that both massed and distributed practice are crucial (Willingham, 2002; Hattie et al., 2017). Massed practice occurs immediately, while distributed practice occurs over days, months, or even years. When I was in my twenties, my father taught me how to tie a specialty knot called a trucker's hitch. He taught me well, providing several opportunities for immediate practice (with feedback), and I was able to successfully tie a trucker's hitch that day. However, I did not practice over time, and consequently, I no longer remember how to tie a trucker's hitch. On the other hand, my mother taught me how to tie my shoelaces when I was two years old. As you can imagine, I practiced a little every day and I have never needed a second lesson.

Massed practice occurs when the concept or skill is first learned. This helps move the learning into long-term memory. However, keeping learning accessible in long-term memory requires practice over time. This means coming back to review essential concepts and skills throughout the school year and in subsequent school years as that learning is relevant. Fortunately, in math, prior learning is key to understanding new concepts. Therefore, there are ample opportunities and reasons to review prior knowledge. But practice implies more than a quick reminder about a concept or skill. Students actually need to use the knowledge.

Incidentally, the best strategy for practicing basic math facts is through small amounts of daily practice. Accordingly, the Institute of Educational Sciences recommends that "Interventions at all grade levels should devote about 10 minutes in each session to building fluent retrieval of basic arithmetic facts" (IES, 2009).

Moving Math into Long-Term Memory (cont.)

Novelty

Novelty serves as an attention getter. The interest a novel situation, application, question, thought, or circumstance generates makes it instantly and at least momentarily meaningful to the learner. Research indicates that content is more likely to get students' attention when it is "emotional (not bland), specific, and novel" (Jensen, 2005). When I was working on a kibbutz in Israel one summer, hitchhiking was my only means of getting around.

The first ride I ever received has never been forgotten. The first thing the driver did to make room for me was move his submachine gun from the passenger seat over to the driver-side door. My driver, like many Israelis traveling close to the border, was armed as a safety precaution. What imprinted the moment on my memory was the surprise and novelty of the situation. I definitely was not expecting an armed escort.

Novelty excites an emotional response, and brain research shows a direct correspondence between the level of an emotional response and how ingrained the stimulus becomes in our long-term memory. It may be rare that we can inspire high levels of emotional excitement in our math classrooms, but we can bring smaller degrees of novelty through questions, connections, applications, activities, and accomplishments that garner important levels of positive emotional responses from students. Through these positive responses, we can motivate and move learning to long-term memory.

Sense-Making

Conceptual knowledge is the hardest type of math knowledge for students to learn (Willingham, 2010). The reason activating prior knowledge is often crucial is that it helps us make sense of and remember new information, especially learning concepts. This is because mathematical ideas build on each other. For students to make sense of this knowledge, they need to think about it. As Daniel Willingham says, memory is "the residue of thought, meaning that the more you think about something, the more likely it is that you'll remember it later" (2009). Students need to spend time thinking about what they are learning and analyzing how ideas connect together. This means teachers need to ask students deeper-level questions, and require reasoning, discourse, writing, and explanation in the math classroom. One of the key questions the brain asks itself in order to decide whether or not to move knowledge to long-term memory is, "Does this make sense?" (Sousa, 2008). Learners need new knowledge to connect to previous knowledge in ways that make sense. Making sense of ideas, concepts, and procedures helps us organize them into a mental filing system that allows for reliable retrieval when the information is needed and provides anchors in our brains for these ideas to fasten themselves onto for long-term memory.

Meaningfulness

Sousa explains that the brain decides whether to keep something in long-term memory, absent from the survival value or the emotional elements, based on two things: does it make sense, or does it have meaning? (Sousa, 2008). When I was a teenager, I complained to a friend that whenever I worked in the garage with my dad, he got upset at some point with what he was trying to fix, threw some tools across the garage, and then gave up and went inside the house. Later he would return by himself and fix whatever needed fixing. I couldn't understand why he reached a point of frustration while I was there and would overcome it when he returned without me. My friend said, "Your father likely used that time in between to figure things out in his head. When he returned, he was more relaxed, had a plan, and was able to finally solve it. It really had nothing to do with you. You just happen to be there during the frustration part." I have never forgotten that explanation. It connected key ideas together. My friend's simple analysis made sense about something that was meaningful to me.

In school we often use grades, graduation, and recognition to try to make learning meaningful. However, these make learning meaningful only to the degree in which they resonate with students' survivalist instincts. Most of the time meaningfulness needs to come from intrinsic sources. When students ask, "Why do I need to learn this?" or "When will I ever use this?" we need better responses than "It will be on the next test." As a teacher, I noticed that whenever I had students solve situational or real-life problems, or make concrete-to-visual-to-abstract connections, the less likely they were to ask, "When will I ever use this math?" No matter which math program we use, there are almost always opportunities in the material for these types of connections and for engaging problem-solving.

Meaningfulness may be the one consistent method through which memories are made permanent. While meaningfulness may always be necessary, it may not be sufficient. If we look back at each of the other three methods—practice, novelty, and sense-making—we see a clear pattern: each greatly benefits from being coupled with meaningfulness, and each can help create meaningfulness. Novelty excites interest, sense-making makes knowledge manageable and connected to other knowledge, and practice helps build success and free up working memory.

Think of these four attributes as forces for learning. To move learning into long-term memory, a sufficient amount of total force is required. The strongest force is meaningfulness. However, it is combinations of practice, novelty, sense-making, and meaningfulness that result in learning taking up permanent residence in memory.

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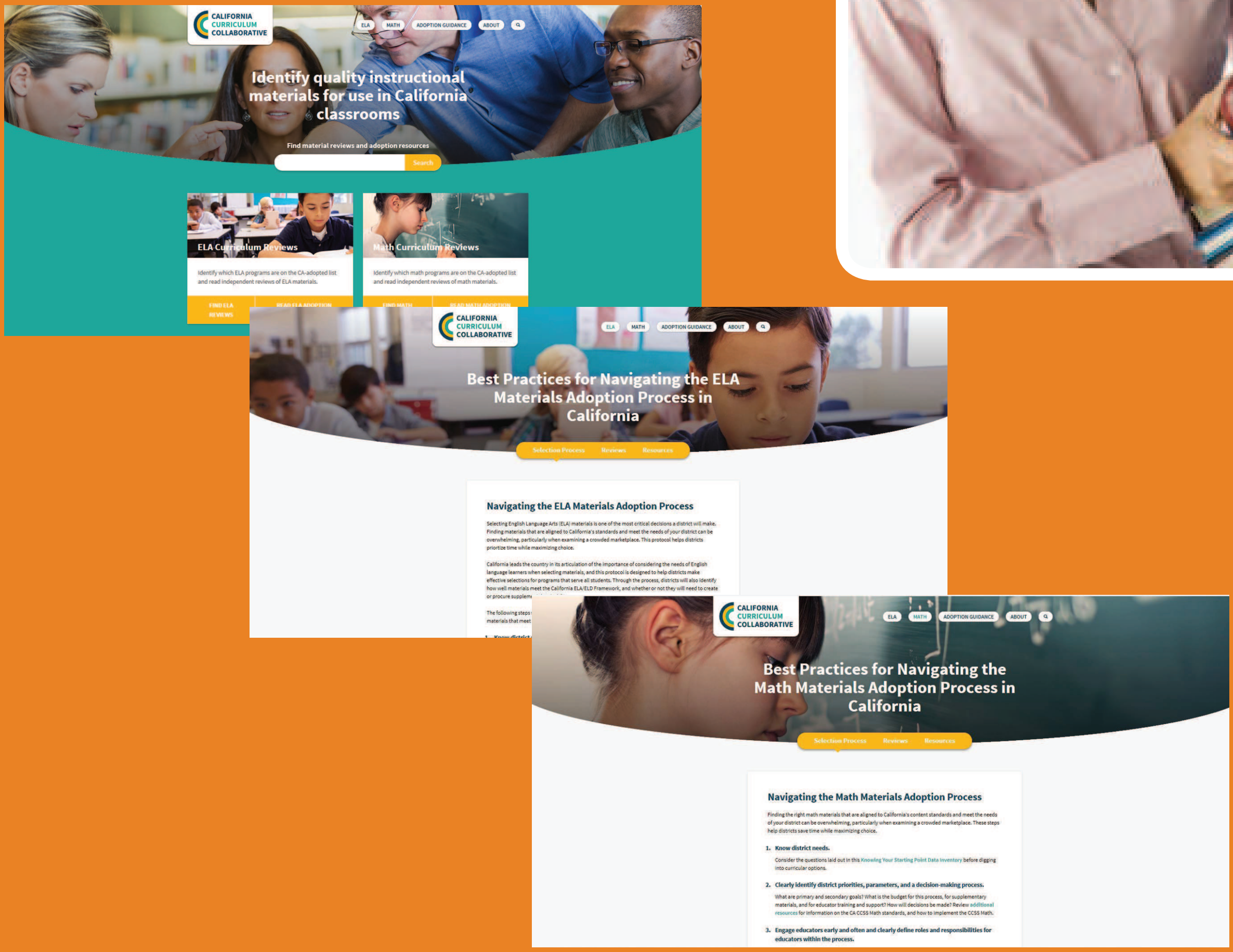
CORE Leadership Corner: A New Resource for Curriculum Review

The California Curriculum Collaborative provides resources and independent, educator-led reviews to inform the decisions leaders and teachers make to identify quality materials for use. Although this is a service provided to California educators as a way to review alternative curriculum resources that are not state adopted, many of the curricula reviewed are national. Therefore, this website can be a resource regardless of the state you are in. Go to http://www.calcurriculum.org/ to access this free resource.



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