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CORE **Reading Expert**

Book Review: *Essentials of Assessing, Preventing, and Overcoming Reading Difficulties*

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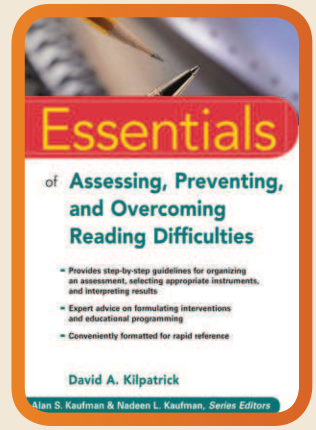
In this Fall 2015 issue of the Reading Expert, I review a new book by David A. Kilpatrick, Ph.D., called *Essentials of Assessing, Preventing, and Overcoming Reading Difficulties*. This book was recommended by our brilliant colleague, Louisa Moats, who said that it made her think differently about reading instruction and intervention. I highly recommend this book and hope that my review will encourage you to discover for yourself what Dr. Kilpatrick has to say. Noteworthy about the author is that he is a practicing school psychologist in Syracuse, New York, and an assistant professor at SUNY College at Cortland. He has conducted well over 1,000 evaluations of students with reading difficulties.

This book is divided into three main sections:

- A brief but thorough overview of reading development
- A fairly technical discussion about assessing the various domains of reading
- A very informative discussion of prevention and intervention approaches



In the first section, Dr. Kilpatrick provides an historical overview of three classical approaches to reading instruction: the visual memory hypothesis of word reading, the three cueing systems model (currently en vogue in many districts across the country), and the phonics approach. In this chapter, he explains why some of our current and past practices aren't effective, suggesting that the first two approaches are not consistent with the research on reading acquisition. He asserts that these two approaches parallel how poor readers approach text rather than how skilled readers do. It should be made clear here that Kilpatrick is addressing word-level instruction when talking about these models. He is not discussing specifics around vocabulary and comprehension instruction.

For the phonics approach, Kilpatrick states that while the research is clear that phonics approaches have demonstrated superior outcomes to these other methods, some problems with traditional phonics instruction should be addressed. He points out that many intervention studies demonstrated that students display improved phonics skills, but often show limited improvements in overall word reading. In Chapter 4 he addresses what the issues are with traditional phonics instruction and states that he believes that what is described in this chapter is the biggest contribution of the book.

Orthographic Mapping

Chapter 4, "Understanding Word Recognition Difficulties," addresses several questions, including the following:

- Why do some students have word-level reading difficulties or disabilities?
- Why do some students struggle with learning phonics?
- Why do students with reading problems struggle with reading fluency?
- Why do students struggle with reading comprehension?
- Why do most intervention studies with weak readers show minimal to modest gains but some demonstrate very large improvements?

Based on an extensive research review, Kilpatrick posits that orthographic mapping is the "holy grail" of reading education and is at the core of reading difficulties. Linnea Ehri and others have been researching orthographic mapping for several decades. Ehri 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" (2014). Kilpatrick describes further orthographic mapping:

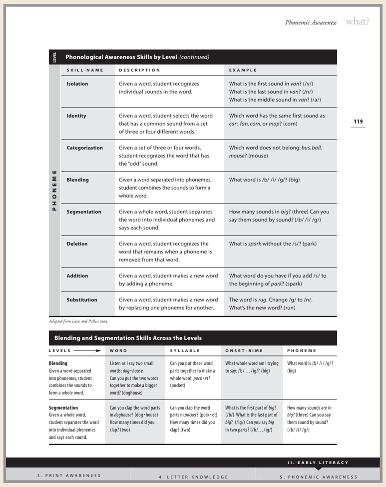
> …the mental process readers use to store written words for later, instant retrieval. Orthographic mapping explains how students turn unfamiliar words into instantly accessible sight words, with no sounding out or guessing. This is something that weak readers do very poorly, and as a result, they have limited sight vocabularies and limited reading fluency. Orthographic mapping represents a very large part of reading acquisition and should guide curricular decisions, evaluation practices, and intervention approaches. (p. 18)

In other words, orthographic mapping occurs when a word has been decoded enough times that it becomes a word recognized by sight. Kilpatrick refers to these as “sight words.” For additional information regarding Linnea Ehri’s research and her phases of word recognition development, refer to CORE’s *Teaching Reading Sourcebook*, pp. 163–167. Orthographic mapping occurs in her last phase of development, what she calls the automatic phase.

Kilpatrick contends that supporting students’ full orthographic mapping is the key to proficient reading. In typically developing readers who have a solid phonological awareness base that continues to naturally develop as they become more proficient readers, orthographic mapping seems to occur relatively easily and naturally with reading practice. However, weak readers who do not have a solid phonological awareness base to begin with do not develop more advanced phonological skill even if they have been remediated in kindergarten or first grade to achieve improved decoding skills. Thus, orthographic mapping is challenging for them.

Orthographic Mapping and Phonological Awareness

How is orthographic mapping developed in weak readers? Advanced phonological awareness that involves the ability to manipulate phonemes (phoneme substitution, phoneme deletion, and reversing phonemes) seems to be an important underpinning for successful orthographic mapping. Page 119 of CORE’s *Teaching Reading Sourcebook* provides an overview of phonological skills by level with examples. An example of phoneme deletion is, what is spark without the /s/ (*park*). An example of phoneme substitution is replacing the last sound, /g/, in *rug* to /n/ (*run*).


Phonemic Awareness what?

Phonological Awareness Skills by Level *(continued)*

LEVEL	SKILL NAME	DESCRIPTION	EXAMPLE
PHONEME	**Isolation**	Given a word, student recognizes individual sounds in the word.	What is the first sound in *van*? (/v/) What is the last sound in *van*? (/n/) What is the middle sound in *van*? (/a/)
	Identity	Given a word, student selects the word that has a common sound from a set of three or four different words.	Which word has the same first sound as *car*: *fan, corn,* or *map*? (corn)
	Categorization	Given a set of three or four words, student recognizes the word that has the “odd” sound.	Which word does not belong: *bus, ball, mouse*? (mouse)
	Blending	Given a word separated into phonemes, student combines the sounds to form a whole word.	What word is /b/ /i/ /g/? (big)
	Segmentation	Given a whole word, student separates the word into individual phonemes and says each sound.	How many sounds in *big*? (three) Can you say them sound by sound? (/b/ /i/ /g/)
	Deletion	Given a word, student recognizes the word that remains when a phoneme is removed from that word.	What is *spark* without the /s/? (park)
	Addition	Given a word, student makes a new word by adding a phoneme.	What word do you have if you add /s/ to the beginning of *park*? (spark)
	Substitution	Given a word, student makes a new word by replacing one phoneme for another.	The word is *rug*. Change /g/ to /n/. What’s the new word? (run)

Adapted from Lane and Pullen 2004.

Blending and Segmentation Skills Across the Levels

LEVELS →	WORD	SYLLABLE	ONSET-RIME	PHONEME
Blending Given a word separated into phonemes, student combines the sounds to form a whole word.	Listen as I say two small words: *dog*•*house*. Can you put the two words together to make a bigger word? (doghouse)	Can you put these word parts together to make a whole word: *pock*•*et*? (pocket)	What whole word am I trying to say: /b/ … /ig/? (big)	What word is /b/ /i/ /g/? (big)
Segmentation Given a whole word, student separates the word into individual phonemes and says each sound.	Can you clap the word parts in *doghouse*? (dog•house) How many times did you clap? (two)	Can you clap the word parts in *pocket*? (pock•et) How many times did you clap? (two)	What is the first part of *big*? (/b/) What is the last part of *big*? (/ig/) Can you say *big* in two parts? (/b/… /ig/)	How many sounds are in *big*? (three) Can you say them sound by sound? (/b/ /i/ /g/)

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II. EARLY LITERACY

3. PRINT AWARENESS 4. LETTER KNOWLEDGE 5. PHONEMIC AWARENESS

The intervention research indicates that weak readers need direct training in these advanced phonological manipulation skills to improve orthographic mapping. Phonological oral blending and segmenting training is not enough for weak readers. In addition, proficient letter-sound knowledge and decoding ability are also needed, and he explains each of these processes in detail. The appendix provides a chapter from his program, Equipped for Reading Success, which provides word study methods that promote orthographic mapping.

Kilpatrick explains why advanced phonemic awareness is necessary for efficient sight word learning (orthographic mapping), and he then suggests that the best approach for addressing reading fluency is to ensure a student has proficient orthographic mapping skills. He goes on to suggest that fluency should not be viewed as a separate reading subskill, but instead as a byproduct of having instant access to most or all of the words on the page. We refer to this as automaticity, and I would argue here that Kilpatrick provides an incomplete discussion of fluency, as fluency is more than just automaticity.

Kilpatrick then questions our current practice of assessing only the basic levels of phonemic awareness of blending and segmenting. Numerous research reports include data to show that from first grade onward, manipulation tasks display higher correlations with reading measures than segmentation tasks. He argues that “Phonological manipulation tasks are more sensitive to reading development than other phonological awareness tasks. This is likely because one must be able to use the skills tapped by those other tasks (i.e., segmentation, isolation, and blending) to respond correctly to phonological manipulation tasks” (p. 179). Thus, he concludes that segmentation tasks alone are not sensitive enough to identify many of the students with poor phonological awareness. The book’s appendix provides access to his Phonological Awareness Screening Test (PAST), which includes assessment in phoneme manipulation and provides validity and reliability data to support its use. In addition, CORE’s *Assessing Reading: Multiple Measures* includes a phoneme deletion test that will provide good information as to a student’s level of advanced phonological skill.

Intervention Research

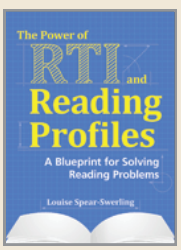
In the last section of the book, Chapters 10 and 11, Kilpatrick reviews the intervention research. In this section he categorizes the intervention research into three categories of outcomes:

- Minimal outcomes
- Moderate outcomes
- Highly successful outcomes

Category 3 intervention research represented a small minority of the intervention studies that obtained improvements on nationally normed word identification tests ranging from 12.5 to 25 standard score points, as compared to 0 to 5 standard score point improvements for Category 1 or 6 to 9 standard point improvements for Category 2. The highly successful outcomes studies all had three things in common. They all "aggressively addressed phonological awareness difficulties" and taught advanced phonological awareness skills, provided phonic decoding instruction, and provided sufficient opportunity to practice these skills with reading connected text. This combination of intervention elements allowed these students to develop the capacity to quickly and reliably add words to their sight vocabularies. Kilpatrick goes on to provide an analysis of several well-known and widely used intervention curricula and whether they contain these three elements: advanced phonological work, decoding instruction, and reading practice. In many cases, interventions were missing one or more of these.

Summary

I highly recommend this book for those who are interested in furthering their knowledge of the reading research. There is much to the book that I didn't address in this review, including a discussion about comprehension difficulties and how to address various profiles of struggling readers. I would agree, however, that the biggest contribution Kilpatrick makes is explaining the importance of orthographic mapping proficiency and what to do about it.



The Power of RTI and Reading Profiles: A Blueprint for Solving Reading Problems by Louise Spear Swerling also addresses in more practical ways the various profiles of struggling readers. A review of this book will appear in the Winter 2016 edition of the Reading Expert.

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CORE *Marvelous Mathematician*

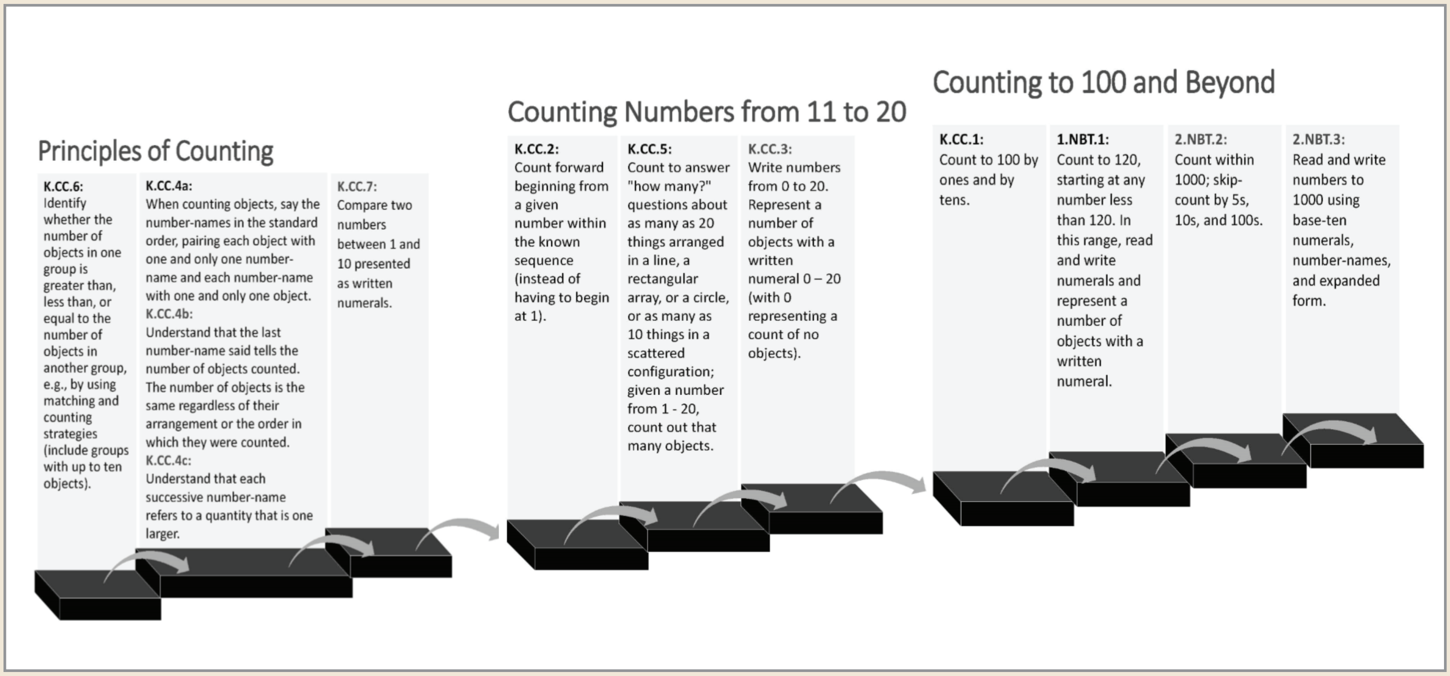
Student Learning Trajectories in Mathematics

by Tena Fulghum, CORE Senior Educational Services Specialist

The idea of student learning progressions is not new in the world of education. For years we have seen the concept discussed many times in terms of reading development. Although the concept may be lesser known in mathematics education, these progressions do exist and are more often called *student learning trajectories*. Regardless of the name given to the concept, the heart of the idea remains the same.

In math, student learning trajectories identify key mathematical and cognitive steps in learning a specific goal that develop over time. The trajectories provide an alignment of these instructional experiences that facilitate growth toward the learning objective. A learning trajectory is in part a "student's-eye" view of math learning as key learning steps are achieved on the way to more sophisticated understanding of one or more related math concepts. From the educator's perspective, student learning trajectories can assist in developing the knowledge needed to define where students are in the educational "path" and what is needed to help move them forward to the expected learning objective (Daro, 2011).

The following example shows how standards themselves are often built with trajectories in mind. The following trajectory for counting is pulled from the Common Core State Standards for Mathematics.



When used by a well-informed educator, student learning trajectories can have a profound impact on student learning, as they provide a wide range of information to support both instruction and assessment. For instance, student learning trajectories can be used to inform teachers about what to expect from their students in terms of developmentally appropriate responses or misconceptions. They can also provide educators with a realistic, data-driven basis for choices about when to teach what to whom. Additionally, for those students who show delays in mathematics, these trajectories can be used to help identify key points along the path where students have become stuck as well as instructional tasks to help push them forward (Fuson, 2002).

Student Learning Trajectories in Mathematics (cont.)

Trajectories fit well within a standards-based learning model. This can be seen through a comparison of the developmental stages or hallmarks in children learning to count and the staircase of standards shown previously. According to Douglas Clements and Julie Sarama (2009), counting is a child's main strategy for quantification and children pass through the developmental stages in counting as described below.

Around age 1, a child can name and sing/chant some numbers with no sequence, and can later verbally count with separate words, not necessarily in the correct order, up to five.

Building on the ability to count to five, a child learns to count up to ten with some correspondence with objects.

Instructional tasks of the counting trajectory then support children's progress in the ability to keep one-to-one correspondence between counting words and objects.

Next, children gain the ability to accurately count objects in a line and answer the "How many?" question with the last number counted.

Instructional tasks then support a child's ability to count arrangements of objects to ten, to write numerals 1–10, and to count backward.

Later, a child counts objects verbally beginning with numbers other than one, and can then skip count, using patterns to count.

Next, a child counts imagined items, keeps track of counting acts, and counts units with an understanding of base-ten and place value.

Around age 7, a child can count forward and backward and can consistently conserve numbers even in the face of perceptual distractions such as spreading out objects in a collection.

These developmental levels precede or are integrated into the Common Core Standards for Mathematics. The staircase structure of standards shows how developmentally one standard's understanding may precede another standard.

This is not necessarily to say that one standard should be taught or presented before or after another standard within a grade level. It just indicates that the components in one standard are more likely to develop first in students based on what is understood about the learning sequence for this topic. For instruction, this not only usually offers an excellent guide for the sequencing and content of lessons, but it also provides steps for how to address gaps in learning. For example, if a student struggles with answering the "How many?" question and realizing that the last number counted is that quantity, then based on the learning trajectory just shown, the teacher can step back one level and check student understanding of one-to-one correspondence. After making sure that understanding of one-to-one correspondence is in place, the teacher can then proceed to work more directly with the student on seeing the connection between the last number counted and the total number of objects being counted.

Student Learning Trajectories in Mathematics (cont.)

The application of student learning trajectories in a standards-based system, like the Common Core State Standards for Mathematics, provides direct guidance on a grade-to-grade basis of what is to be covered and achieved by students. Standards can provide the framework in which the learning trajectory for a particular concept can be developed (Daro et al., 2011). It is important to note that not every hallmark found in a trajectory will have a corresponding standard. The standards will cover the major hallmarks of the trajectory. This allows student learning trajectories to further be used to help unpack those standards by explaining how mathematical concepts build through a grade level, how they might relate to other ideas at that same grade level, and how the concepts build from grade to grade over time. When these two pieces—trajectories and standards—come together, they articulate a clear message of what the goals are for student learning and how to help most students reach those goals. Student learning trajectories can directly aid teachers by describing specific cognitive behaviors at various levels of sophistication, how those behaviors manifest in the actions and words of students, and the typical alternative conceptions of students relative to a given concept.

The trajectories are theories supported by practical experiences about the key points students are likely to go through as they learn mathematics. This is not to say that learning trajectories describe an inevitable order of mathematical learning that must be followed to the letter of the law. The idea is more along the lines that math learning in very young children develops in fairly universal ways, while later growth and development with math is a result of carefully crafted experiences with math and instructional environments that consider both previous and future learning with math concepts. In other words, though many different paths of learning may exist in a single trajectory, there are conceptual hallmarks (important ideas) that students must encounter and obstacles (predictable patterns of error, misconceptions, and alternative conceptions) they must navigate to progress forward. This is why trajectories are often best used in the context of specific math topics and used to depict the hallmarks in the development of student thinking. The entire idea rests on what we all know: learning builds over time, and instruction must take into consideration what has gone before and what will come next.

Much research and development is on the horizon for student learning trajectories in mathematics. For educators today, the biggest benefit from becoming familiar with these progressions is the ability to use this information in conjunction with the curriculum being taught as guides for providing the needed learning supports for students to be successful. The trajectories can help teachers generate key questions, promote discourse, and actively facilitate their students' progress through the learning path. Finally, these trajectories help teachers further their own pedagogical content knowledge and support teachers in fostering new ways of conveying mathematical ideas.

To see an interactive chart of learning trajectories connected to the Common Core State Standards developed at North Carolina State University with Dr. Jere Confrey and Dr. Alan Maloney, visit https://turnonccmath.net/index.php.

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Daro, P., Mosher, F., & Corcoran, T. (2011). Learning trajectories in mathematics: A foundation for standards, curriculum, assessment, and instruction. *CPRE Research Reports*. Retrieved from http://repository.upenn.edu/cpre_researchreports/60.

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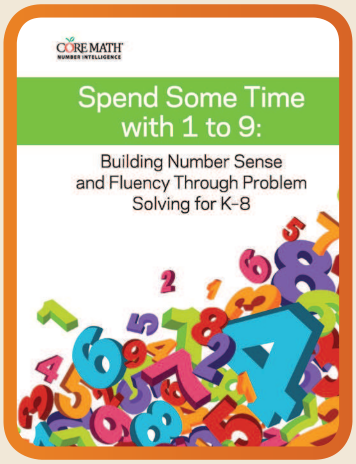
Math Problem Corner



—From *Spend Some Time with 1 to 9* (CORE, 2014)

Put Six in the Mix
Place All Six Digits into Each Inequality Statement to Make It True

[2] [4] [5] [6] [7] [8]

1. Place **all** six of the digits from the set above into the blank spaces in each inequality shown to the right to make the statement true.

   You must use all six digits in each statement. For example:

   4.[2]3[6] < [4].3[5] < 4.3[7][8]

2. Is there any statement that is impossible to make true? Why?

3. Show at least two possible solutions for any problem that can have more than one solution.

4. What ideas or strategies did you use to help you solve some or all of these problems? Why do your ideas/strategies work?

a. 4.□3□ < □.3□ < 4.3□□

b. □.3□ < 4.3□□ < 4.□3□

c. 4.3□□ < 4.□3□ < □.3□

d. 4.3□□ < □.3□ < 4.□3□

e. □.3□ < 4.□3□ < 4.3□□

f. 4.□3□ < 4.3□□ < □.3□

CORE Leadership Corner: Building RtI Capacity

I recently attended the International Dyslexia Association Conference in Dallas, TX. One of my former colleagues from University of Texas, Austin's Meadows Center for the Prevention of Educational Risk presented her new website: Building RtI Capacity (http://buildingrti.utexas.org/). This website is amazing. It offers a plethora of resources for math, literacy, and behavior—documents, videos, podcasts, and webinars about RtI.

Whether you are in the midst of your RtI implementation, looking to revamp it, or just getting started with an RtI model at your school or district, I encourage you to check out this website and use the resources for your school sites. Click the Resources tab on the left side and start with Campus Resources, and you will soon be lost in RtI-land.