THE SCIENCE OF READING

Research and Frameworks

INTRODUCTION

We're dedicated to the application of basic and pedagogical research toward the development of products designed to improve student and educator outcomes. As such, we have drawn upon decades of rigorous literacy research, as well as our collaborative work with preeminent reading researchers and experts, to inform the design, development, and ongoing efficacy testing of our literacy solutions.

How do students learn? This question is at the core of learning science—and at the core of our approach to optimizing learning. We recognize that equitable literacy education provides learners with the instruction they need, when they need it, while also providing a robust learning experience that addresses each of the critical skills and competencies needed for successful literacy development.

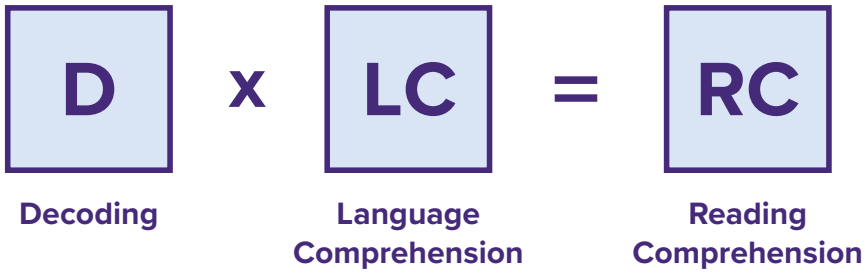
What is the Science of Reading?

The body of research evidence known as the Science of Reading is comprised of more than forty years of research into how we learn to read and analyses of the instructional practices that have been repeated and validated consistently over time and with proven results. It has led to the identification of several key pillars that are the core of any effective literacy program: Phonemic Awareness, Phonics and Word Recognition, Fluency, Vocabulary and Language, and Comprehension. These studies—among others—have also provided valuable evidence about the most effective ways to teach these key components of literacy.

TWO IMPORTANT VIEWS

There are two ways these elements of reading are often presented to support understanding: the Simple View of Reading and Scarborough's Rope.

The Simple View of Reading



The Simple View formula of reading

The Simple View formula presented by Gough and Tunmer in 1986 is one model of how reading comprehension is achieved. While the model is called the "Simple View of Reading," we should not infer that the teaching of reading is simple. In fact, Louisa C. Moats refers to the teaching of reading as "rocket science" (Moats, 2020).

The Simple View of Reading was developed to clarify the role of decoding in reading (Gough & Tumner, 1986). It contends that there are two basic processes integral to reading: decoding and language comprehension. Decoding is the ability to translate text to oral language; readers then use their knowledge of language to make sense of the decoded message. Basically, reading comprehension is the product of these two processes. Readers who are low in either decoding or oral language ability will have difficulty comprehending.

The Simple View stands in stark contrast to approaches that minimize the importance of decoding. For instance, it has been claimed that strong decoding skills are not necessary for successful reading comprehension if other language abilities can be used as an alternative route to decoding. This claim has led to instructional approaches that stress preparing beginning readers to compensate for weak decoding skills by guessing at new or unfamiliar words through a process known as "three cueing" or MSV (Meaning, Structure, Visual). However, neurological and cognitive science research has shown that proficient reading depends upon decoding rather than these alternative routes and that the brain learns to read by mastering decoding (Hanford, 2019). Decoding instruction teaches students to use a process of blending phonemes (sounds) represented by graphemes (letters) to identify new or unfamiliar words. During this process, students use all the sound/letters connections and engage in repeated practice until they achieve accurate decoding and acquire a lexicon of sight words that allows them to read fluently.

"The Simple View of Reading," (Farrell, Hunter, Davidson, & Osenga, 2019) outlines findings from the research that support the Simple View:

- The Simple View formula makes clear that strong reading comprehension cannot occur unless both decoding skills and language comprehension abilities are strong.
- Intervention for struggling readers is likely to be most effective when it addresses the student's specific weakness, which may be decoding, language comprehension, or both.
- Decoding and language comprehension skills can be addressed separately for both assessment and teaching, although both are required to achieve reading comprehension.

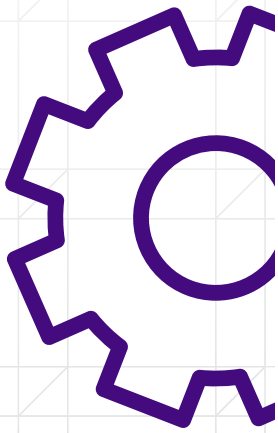
Scarborough's Rope

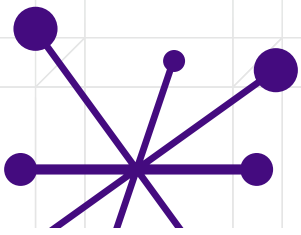
Alternatively, Scarborough's Rope model is a related view of reading, using the metaphor of a rope where reading skills are represented by different strands that "weave together" to create a strong reader. It was developed in 2001 by Dr. Hollis Scarborough to introduce and explain the complexities involved in learning to read that underlie the "simple view" (Scarborough, 2001).

Scarborough's Rope essentially deconstructs the Simple View of Reading by revealing some of the underlying cognitive components that make up decoding and language comprehension.

According to this model, the components that contribute to the ability to read words include items like phonological awareness, decoding, and sight recognition. Reading comprehension, on the other strand, depends upon skills like vocabulary, language structures, verbal reasoning, and so on. Research has found that all of the components represented in the rope benefit from explicit instruction and practice, and component mastery is usually accompanied by improvements in reading. And, as the rope metaphor suggests, these skills are not independent; students must learn how to integrate and orchestrate them together.

Scarborough's apt representation doesn't purport to be comprehensive; rather, it indicates some key features of reading. In her later writings, Dr. Scarborough points out additional components of reading, such as reading comprehension strategies, working memory, planning, and so on (Cutting & Scarborough, 2012).



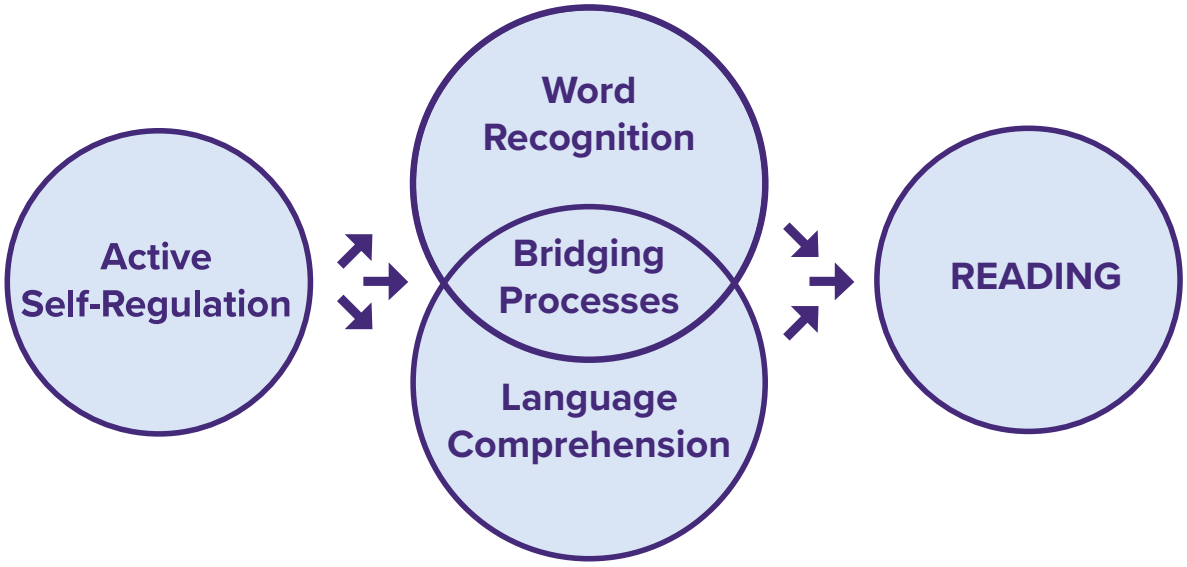


THE RESEARCH CONTINUES

The Science of Reading is not a fixed body of research. In the words of Nobel prize-winning scientist and engineer, John Bardeen, "science is a field which grows continuously with ever-expanding frontiers."

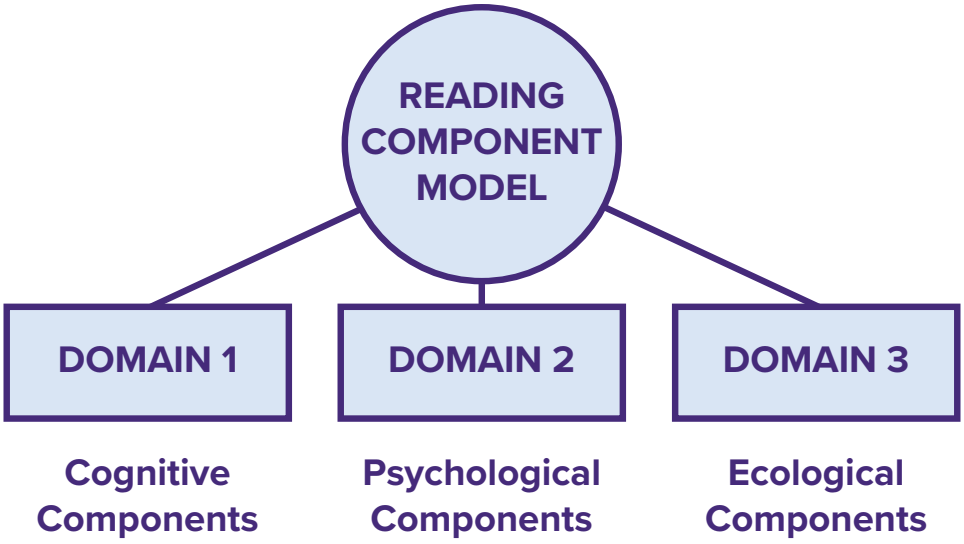
As evidenced by Dr. Scarborough's more recent work and by the more than three decades of research since the introduction of the Simple View of Reading, our understanding of how we learn to read continues to develop and deepen in light of new scientific findings.

There are now multiple models of reading that incorporate recent research, address additional domains, and expand our knowledge. Three such models are the Componential Model of Reading by Drs. Joshi and Aaron, the Active View of Reading by Drs. Duke and Cartwright, and the work of the RAND Reading Study Group around reading comprehension. These models are not a comprehensive or exhaustive overview; they provide a representative sampling of the important research that has been added to the Science of Reading in more recent years.



The Active View of Reading

Drs. Nell Duke and Kelly Cartwright have identified significant overlap between word recognition and language comprehension. In “The Science of Reading Progresses: Communicating Advances Beyond the Simple View of Reading,” the authors review recent research to support their findings that word recognition and language comprehension are not entirely separate, and important processes bridge them, including vocabulary, reading fluency, and morphological awareness (Duke & Cartwright, 2021). Their research synthesis also finds that there are many contributors to reading that were not included in the Simple View of Reading—including self-regulatory processes such as executive function skills and motivation—that play a substantial role in reading (Duke & Cartwright, 2021). These elements are part of a theory that expands upon the Simple View of Reading, which the authors are calling an Active View of Reading (Duke & Cartwright, 2021).

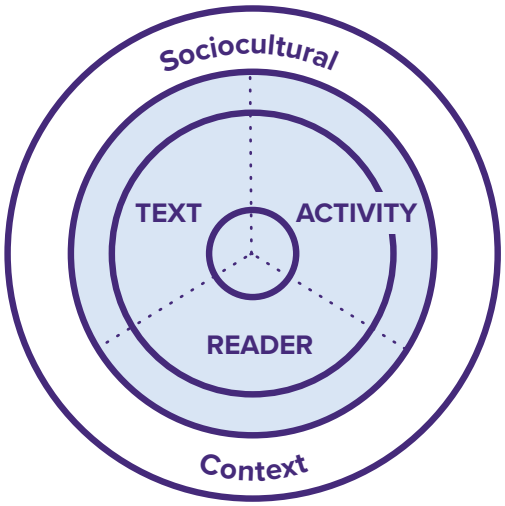


The Component Model of Reading

In “The component model of reading: Simple view of reading made a little more complex,” Drs. R. Malatesha Joshi and P.G. Aaron expanded upon the Simple View of Reading with their Component Model (Joshi & Aaron, 2000). The Component Model treats decoding as a prerequisite for word-recognition skill. Sight-word reading emerges as an important aspect of word recognition around the fourth grade; since sight-word reading skill appears to be built on decoding skill and is not independent of decoding skill, it is not treated independently in this model (Joshi & Aaron, 2000). The Component Model aims to provide a more comprehensive view and introduces additional factors and domains that contribute to reading achievement. Factors include the home environment, dialect, motivation, peer influence, English as a second language, and the classroom environment, among others. The factors are classified into three domains—cognitive, psychological, and ecological—which should all be examined as part of the diagnosis and intervention of literacy problems (Joshi & Aaron, Componential Model of Reading (CMR): Validation Studies, 2012).

The RAND Model of Reading Comprehension

Dr. Catherine Snow and the RAND Reading Study Group have also proposed a research-based model for understanding reading comprehension. They began by defining the term reading comprehension as "the process of simultaneously extracting and constructing meaning through interaction and involvement with written language" (Snow, 2002). This model consists of three elements: the reader (who is doing the comprehending), the text (that is to be comprehended), and the activity (in which comprehension is a part). Furthermore, their model finds that reading comprehension "occurs within a larger sociocultural context that shapes and is shaped by the reader and that interacts with each of the elements iteratively throughout the process of reading" (Snow, 2002).



Identifying Research-Based Practices

Many advocates seem to argue for the direct application of Science of Reading research findings drawn from the neurosciences and cognitive psychology to reading instruction. This approach has been found to be problematic (Shanahan, 2020) since instructional applications drawn from these sources have often proven to be ineffective. Basic scientific findings about how reading works and how it is learned must be translated into pedagogical approaches that then should be rigorously evaluated to ensure their effectiveness. True "Science of Reading instruction" needs to be consistent with the findings of such instructional studies.

While there is no governing body or organization charged with evaluating the consistency or degree of alignment that instructional programs have with the Science of Reading and rigorous instructional evaluation, some states (including Florida, North Carolina, and Colorado) and organizations like the Reading League (The Reading League, 2021) and EAB (EAB Global, Inc., 2021) are creating their own rubrics to help educators determine which programs are supported by the Science of Reading. However, those rubrics vary in what they cover and the quantity or quality of research evidence they require.

It's important to note that the Science of Reading is extensive, complex, and ever-changing, and does not exist in any one program or book. Specific instructional practices and approaches can be supported by research and compared to one another in terms of their effectiveness at raising reading achievement. Pedagogical research tends to focus on instructional practices–not on specific curricula or literacy programs. A certain program may be better *aligned* to the Science of Reading based on the practices that it employs to teach the key areas of reading, but no program is "a Science of Reading program."

UNDERSTANDING THE RESEARCH ON THE SCIENCE OF READING

With the current focus around the Science of Reading and research-based practices, there is a potentially overwhelming amount of research and information available to educators. Educators will also find that the conclusions of published research can be contradictory or inconsistent with other research findings, resulting in confusion. For these reasons, there is a need for everyone involved in the education of our learners to know how to determine the validity of such research. There are many ways to accomplish this, but two possible tools to help us to wade through the plethora of research are meta-analyses and effect size.

Meta-analysis

Dr. Jan Hasbrouck and colleagues (2021) caution educators to "never change classroom practice based on a single study" (Hasbrouck, Shanahan, & Fisher, 2021). She reminds us that "we need a convergence of evidence, over time, in well-constructed studies, analyzed by experts" before we make any changes to classroom practice. She urges educators who are expanding their knowledge of the Science of Reading to look toward meta-analyses of research, like the work of the National Reading Panel (National Reading Panel, 2000), before making changes to classroom practices. Meta-analysis is a method for combining relevant qualitative and quantitative data from multiple studies to develop one conclusion with greater statistical importance. It can be used to establish significant findings when

studies have conflicting results and to provide stronger data due to greater diversity among subjects, increased number of subjects, and the aggregate effects and results (Himmelfarb Health Sciences Library, 2021).

The goal of these types of reviews of multiple studies is to ensure that someone with research experience is sorting through the data and methodology, establishing a standard of quality, evaluating the various studies, and providing a comprehensive summary of findings and interpretation that authors, curriculum providers, and educators can use to impact what happens in the classroom.

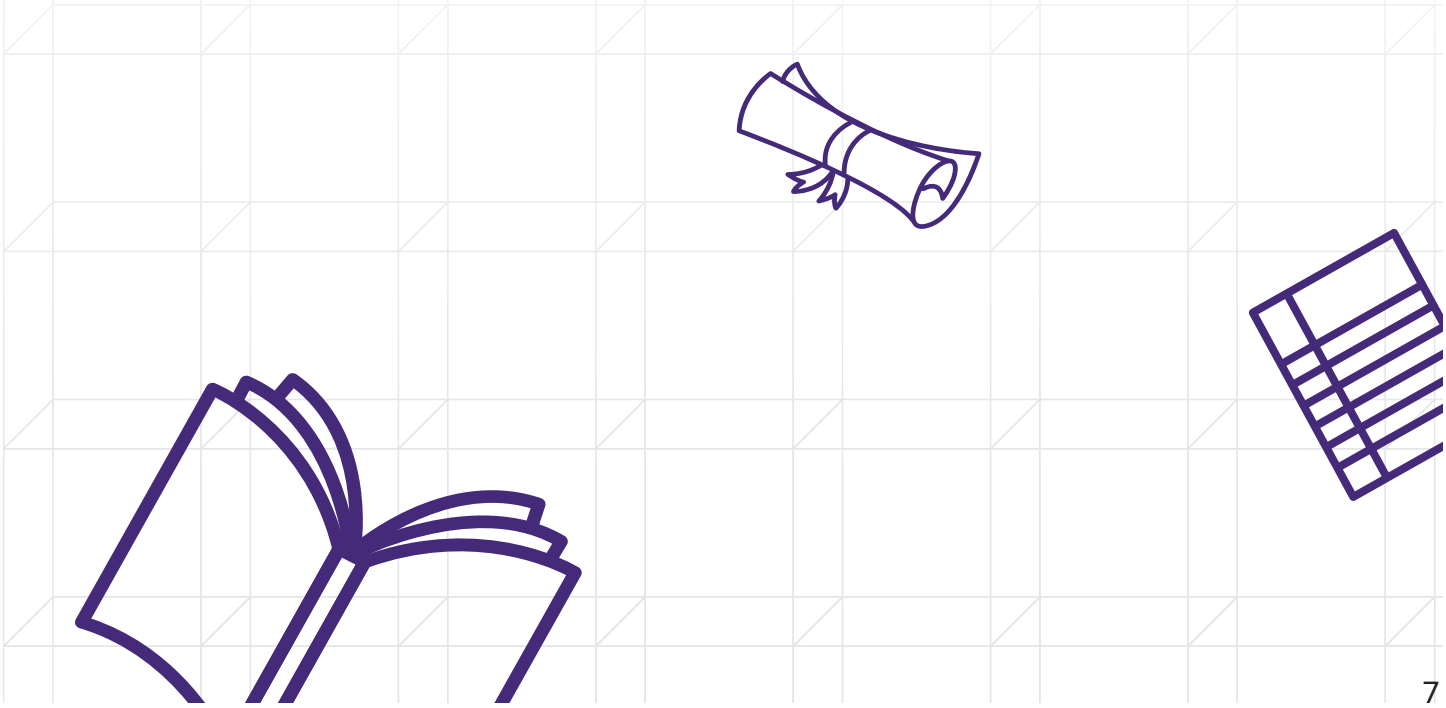
Meta-analyses are not prevalent. There may be many topics of interest to educators that are not covered in a meta-analysis, so it's important to be able to read and question individual articles with a critical and discerning eye to better understand the research space.

Effect size

To establish that a practice or approach is effective and supports the Science of Reading, it needs to be research-based and more effective than "standard practices" in that it delivers some added learning advantage for students over those existing practices. Effect size is an important measure to gauge these advantages in both individual studies and meta-analyses.

Effect size is a measure that can be evaluated for practical importance of a research outcome; it answers the question, "How well did this work?" *Practical importance* shows that the effect size is large enough to be meaningful in the real world (as compared to *statistical significance*, which shows that an effect was not likely to have occurred by chance alone).

One of the most common ways to use effect size is to determine the efficacy of an instructional practice *relative to* a comparison group or approach (the "standard practice"). Effect size indicates if an approach works, but it also predicts how much impact to expect in a range of scenarios. A large effect size means that a research finding has practical value and a strong impact on outcomes, while a small effect size indicates that a finding has limited practical applications. For this reason, effect size is at the heart of research, and understanding the effect size of a research finding is crucial to determining whether that research can be proven effective.



Asking Important Questions

In *Language at the Speed of Sight*, Professor Mark Seidenberg (2017) notes that the "lack of tools to ask hard empirical questions about the validity of [proposals for fixing problems in education] has left the field besieged and vulnerable to a good story and a hard sell" (Seidenberg, 2017, p. 286). However, these "hard questions" are exactly the kinds of questions that must be asked and answered to benefit from the body of research we've come to know as the Science of Reading.

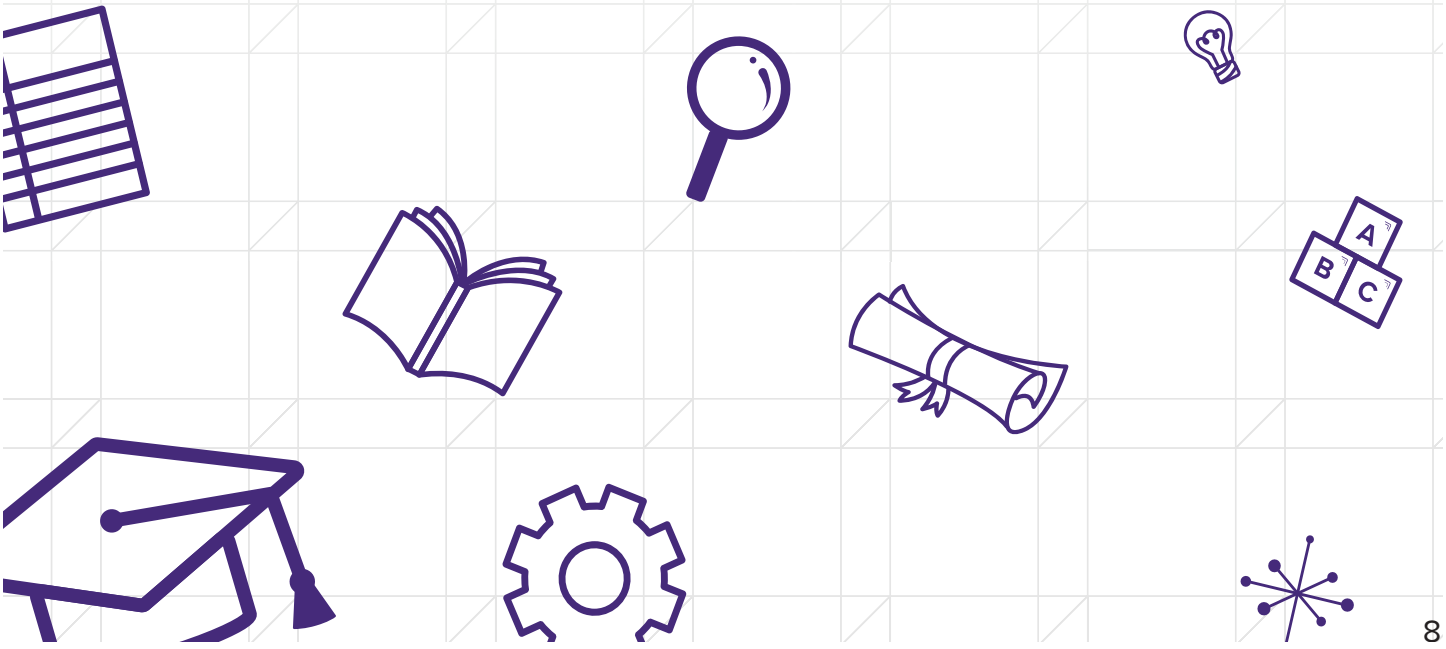
Read more on this topic from Drs. Timothy Shanahan, Jan Hasbrouck, and Douglas Fisher: Important Questions to Ask About Education Research.

SUMMARY

Viewing research through a critical lens and asking important questions can help educators and instructional leaders determine which practices and approaches will have a positive and meaningful impact on helping their students learn to read.

Learning to read can be difficult. In the words of Mark Seidenberg, "Reading is an extraordinarily complex act. [It is a] behavior that is the product of our capacities to see, hear, write, speak, learn, remember, and think" (Seidenberg, 2017, p. 187). Despite this complexity, Seidenberg writes, "reading is an area in which there is a large body of modern research relevant to teaching... ranging from theories that integrate a broad spectrum of findings, ruling out other accounts, to experiments that compare the effectiveness of different methods for teaching specific skills." Throughout this body of research, there is evidence that some methods are more effective at teaching children to read, and others are far less effective (Seidenberg, 2017, p. 286).

By building on scientific insights gleaned from decades of inquiry into how we learn to read, we can change how we approach reading instruction and improve how our children read.



LEARN MORE

Learn more about the research behind our family of literacy solutions and how they are supported by the Science of Reading:

- Straight Talk on the Science of Reading
- Research in Action Brochure
- Foundational Literacy Brochure
- *Reading Mastery Transformations*®: Science of Reading Alignment
- *Open Court Reading* ©2016: Science of Reading Alignment
- *Wonders*®: Science of Reading Alignment

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