The Science of Reading

A Guide to Research on How the Brain Reads

HERE'S WHAT'S INSIDE:

Quiz Do You Know How Reading Works?

3 Skills

That You Might Not Know Are Important to Reading (and How to Build Them)

Cross-Out List Avoid these Debunked

Common Classroom Practices

> Presented by FAST FORWORD[®] Scientific Learning[®]



Do You Know How Reading Works?

The science of reading is the interdisciplinary body of research on the cognitive, biological, linguistic, and social-emotional processes involved in how reading works.

Take this quiz to see how much of the basics of the science of reading you already know. The answers begin on the next page.

Circle True (T) or False (F).

- **1. T F** Reading is a complex activity.
- **2. T F** Reading is a skill that children naturally pick up on their own.
- **3. T F** Reading skills like phonics should be taught explicitly.
- **4. T F** The science of reading is all about phonics.
- **5. T F** Reading is an independent skill separate from speaking and listening.
- **6. T F** Reading difficulties vary, so interventions should not be one-size-fits-all.
- **7. T F** Skilled reading can be completely explained as two strands of skills word recognition and comprehension—that weave together like a rope.
- **8. T F** We now know all there is to know about the science of reading.

The Big Picture: History of The Reading Wars 1940s-50s: Whole word **Top-Down 1970s-1980s:** Whole language sight-reading approach. approach trains students to Approach intuit words using context clues Children were taught to (Comprehension) memorize word lists. rather than phonics. 1960s: DISTAR method, a phonics-based **Bottom-Up** reading program, is created to help children Approach from low-income families improve language (Phonics) skills and reading comprehension.

OUZ **Answers & Explanations 2.** False Reading is not a skill that children naturally pick up

Reading is a complex activity. . True Research on the reading brain has found that reading requires many parts of the

brain to sync, such as:

- temporal lobe | phonological awareness and decoding/discriminating sounds
- frontal lobe | speech production, reading fluen-• cy, grammatical usage, and comprehension
- angular and supramarginal gyrus | connecting letters to read a word
- visual cortex | visual letter & word recognition
- hippocampus | long-term memory

If these regions are less developed or inefficiently interconnected, children can struggle with reading.

on their own.

Reading is not an innate skill. Struggling readers usually cannot figure it out on their own without intervention. Reading can be so challenging that two-thirds of K-12 students in the U.S. are below proficient in reading.¹ The science of reading, if properly translated into pedagogy, could help.

3. True

Reading skills like phonics should be taught explicitly.

The ability to decode is not

intuitive, so learners must be explicitly taught to associate graphemes (e.g., the letter b) with phonemes (*e.g.*, the sound /b/), also called phonics. Such explicit instruction is also necessary for other reading skills. Disagreements over this principle have been at the heart of the Reading Wars (see below).

1990s:

The Simple View of Reading (SVR) reconciles the two sides of the Reading Wars by organizing reading into two interdependent processes of word recognition and comprehension.

1990s: Balanced literacy also attempts to merge the two sides, but practitioners tend to favor whole language practices over phonics.

1990s: Phonological Theory of Dyslexia recognizes the role of phonological awareness in reading.

2000s: Scarborough's Reading Rope represents SVR.

Today: Researchers continue to deepen our understanding of the complexities of reading beyond SVR.



The Big Picture: History of Reading

300,000 years 5,000 years 300 years 50 years 0* years *but hopefully soon!

- Humans have existed
- Humans have been writing and reading
- Modern literacy has become widespread
 - Researchers have systematically documented the science of reading
 - The K-12 education system is fully aligned with the science of reading

4. False

The science of reading is not all about phonics.

The conversation about the science of reading has centered on phonics, but this is just one angle. Reading science also examines other skills, like comprehension and phonemic awareness, and various topics like the neurological basis of dyslexia and how poverty affects reading acquisition. Exclusive focus on a single facet of reading science, like phonics, risks missing the forest for one tree.

5. False

Reading is not an independent skill separate from speaking and listening.

Reading depends on and is intertwined with speech, language, and listening. The written word is a code that represents spoken language, so when we read, we connect what we see on the page with the language we hear and understand.

6. True

Reading difficulties vary, so interventions should not be one-size-fits-all.

Because reading is a complex process, learners may struggle with different aspects. One student may need to work on rapidly accessing word meaning,

while others may focus on phonological awareness. Some researchers compare this individualized approach to reading intervention to fitness training of specific muscle groups.

Skilled reading cannot 7. False be completely explained as two strands of skills—

word recognition and comprehension-that weave together like a rope.

This is the Simple View of Reading (SVR) and Scarborough's Reading Rope.² New research shows that SVR is, well, too simplistic because it excludes general oral language skills, knowledge of academic language, cognitive and executive functions, and other critical skills.

8. False

We do not know all there is to know about the science of reading.

The science of reading continues to evolve and grow more complex as researchers make new discoveries and refine existing theories. As the saying goes, the more you know, the more you realize you don't know.



SKIS You Might Not Know **Are Important to Reading** And How to Build Them

Slow



The Science: Working memory is a greater predictor of academic success than IQ.¹ Children impacted by poverty are disproportionately disadvanted by a less-developed working memory.^{2,3}

Do This: Play memory games, such as concentration, sing songs that periodically add a new line, and more efficiently, use technology built to exercise working memory.

Auditory processing auditory processing, or when the brain can't process sounds quickly, can make phonemic awareness difficult.

The Science: Many children with dyslexia exhibit problems with rapid auditory processing.⁴

Do This: Implement the Fast ForWord[®] 2-in-1 reading and cognitive training program that builds auditory processing (and working memory, too!)

Background knowledge isn't supplemental to reading achievement-it is required.

The Science: Researchers have identified a "knowledge Bickground knowledge threshold": readers who scored less than 59% on a background knowedge test also scored poorly on a subsequent reading comprehension test.⁵

Do This: Encourage extracurricular reading by creating a large classroom library or offering incentives like reading prizes or extra credit.





Rasourcas

Blog Posts

"The Science of Reading: The Basics and Beyond"

"Auditory Processing: What's Sound Got to Do, Got to Do with Reading?"

(The Science of Learning Blog)

Book

Reading in the Brain: The New Science of How We Read (2009) by Stanilas Dehaene



Webinar

"2020 Dyslexia Update: New

Science and Solutions" presented by

Martha Burns, PhD (Director of Neuroscience, Scientific Learning)

Websites

"Inside the Brain of a Struggling Reader" (2015) by Martha Burns. <u>District Administration</u>.

"At a Loss for Words: How a Flawed Idea Is Teaching Millions of Kids to Be Poor Readers" (2019) by Emily Hanford. <u>APM Reports</u>.

Classroom Tool

The **Fast ForWord**® reading and language software was developed by neuroscientists who researched the science of reading and learning. <u>Request free samples</u>.



References

Quiz: Do You Know How Reading Works?

¹ Nation's Report Card. (2019). <u>https://www.nationsreportcard.gov/</u>

² Scarborough, H. S. (2001). Connecting early language and literacy to later reading (dis)abilities: Evidence, theory, and practice. In S. Neuman & D. Dickinson (Eds.), Handbook for research in early literacy (pp. 97–110). New York, NY: Guilford Press.

3 Skills You Might Not Know Are Important to Reading (And How to Build Them)

¹ Alloway, T.P. & Alloway, R.G. (2010). Investigating the predictive roles of working memory and IQ in academic attainment. *Journal of Experimental Child Psychology* 106(1), 20-29.

² Noble, K.G., McCandliss, B.D., & Farah, M.J. (2007). Socioeconomic gradients predict individual differences in neurocognitive abilities. *Developmental Science*, 10, 464–480.

³ Noble, K. G., Norman, M. F., & Farah, M. J. (2005). Neurocognitive correlates of socioeconomic status in kindergarten children. *Developmental Science*, 8, 74–87.

⁴ Gaab, N., Gabrieli, J. D. E., Deutsch, G. K., Tallal, P., & Temple, E. (2007). Neural correlates of rapid auditory processing are disrupted in children with developmental dyslexia and ameliorated with training: an fMRI study. *Restorative Neurology and Neuroscience*, 25(3-4), 295-310.

⁵ O'Reilly, T., Wang, Z., & Sabatini, J. (2019). How Much Knowledge Is Too Little? When a Lack of Knowledge Becomes a Barrier to Comprehension. *Psychological Science*, 30(9), 1344–1351.

