

This Is Your Brain on Reading

PART
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Dr. Anne Cunningham*



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By Dr. Anne Cunningham & Dr. David Rose

How is knowledge acquired and built, and what role does reading play?

It's free reading time in a busy second-grade classroom and Michael is sitting on the rug burning through his third Magic Tree House book of the week. He laps up the pages at a solid pace and comes away with a strong comprehension of the text and a desire to read the next one. Michael's friend Marc is sitting next to him, with a beginning reader in his hands. Marc looks at the words and slowly decodes one word after another, but after a page or two of struggle, he loses the thread of the story, becomes frustrated, and puts the book down. If we were to peek into their classroom, we'd see two seven-year-old boys that are a lot alike—both wearing jeans and sneakers, both reading books. If we were to look at what is going on inside the boys' brains as they read, we'd learn two very different stories.

Imaging Technology Is a Window Into the Human Brain

Imaging technology is helping reading researchers and educators augment their understanding of the complex process of reading development better than ever before. These MRIs tell a vivid and visual story that suggests struggling readers and strong readers show very

different activity patterns in their brains both in the visual system (related to letters and printed words) and in systems

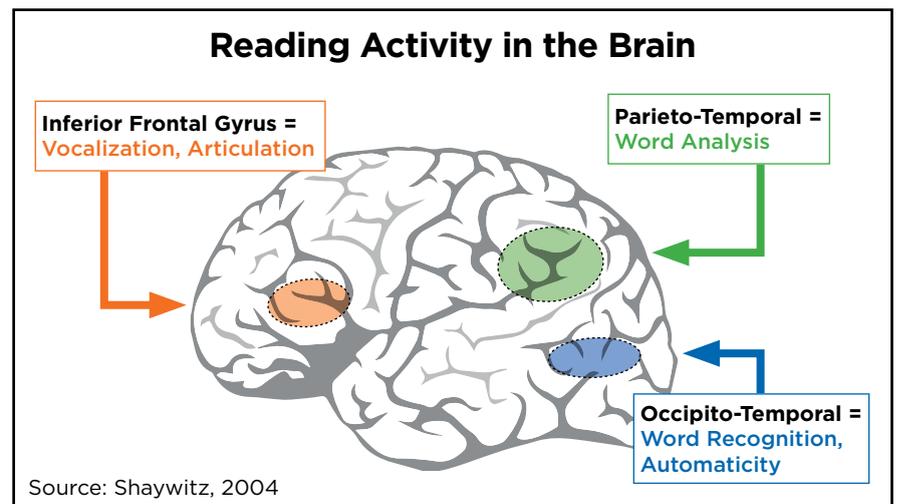
important for language and sounding out new words. Why and how do these patterns differ? How can we encourage the brains of struggling readers to respond more like those of strong readers? These are the questions brain researchers are asking, and the answers may revolutionize the way we teach reading.

There are millions of students like Marc in our classrooms—kids who struggle with reading. The latest NAEP scores tell us that a full two-thirds of our fourth graders nationwide (68%) are below-proficient readers. If we want all our children to succeed as learners and to graduate from high school ready for college and career, we need to harness the power of research and turn this around.

The Brain of a Good Reader vs. The Brain of a Struggling Reader

While reading as a process is consistent, no two brains look exactly the same during reading. However, the patterns that emerge when we study the brains of strong readers tell us that reading and language are in a reciprocal relationship.

Researchers associate the following areas of the brain with reading activity:



Activation patterns in these areas change based on each student's reading ability. For example, beginning readers show more activity in the parieto-temporal, or word analysis, region, while experienced readers become increasingly active in the occipito-temporal, or word recognition, region. Like the brain itself, each pattern of activity is unique.

Rich language experiences early in life contribute to making the brain more receptive to the acquisition of reading skills (skills such as phonemic awareness, decoding, and word recognition). When a child is read to, and then learns to read, his or her brain continues to develop more pathways for language and cognition. The pathways become well traveled, and soon, initially good reading skills can lead to truly great abilities if exercised. Amazingly, reading isn't just a foundational ability for success in school, college, and careers; the act of reading actually makes children smarter.

But what about a child with learning disabilities or a child who did not receive those rich early language experiences that prepare the brain for reading? When we study the brain scans of struggling readers, the patterns of activity are notably different—more scattered, more changeable than those of strong readers. The pathways for language and cognition are not as efficient and established, so the work of reading is harder for the child even though he or she is trying just as hard. And depending on the particular challenges a child faces—for example, if he or she has dyslexia or is an English language learner—the patterns vary even more widely.

We Can Change How the Brain Works

Contrary to what we used to think, the brain is incredibly malleable. Strong, consistent reading instruction can change the way the brain

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“How can we encourage the brains of struggling readers to respond more like those of strong readers?”

works. Two variables contribute to strengthening the neural pathways that allow kids to become strong and successful readers:

- ▶ Deliberate practice. Kids need to hear and read many different kinds of texts as often as possible.
- ▶ Intense instruction. In order to prepare the brain for the increasingly complex texts they will encounter in school, most students need intense instruction toward early mastery of core reading skills—like phonemic awareness, phonics, fluency, vocabulary, and text comprehension.

For some children, learning to read is easy. Their brains are primed and ready. But the majority of children need more; they need differentiated reading instruction that plays to their strengths and addresses their cognitive weaknesses. They need intense, targeted practice on the particular skills with which they are struggling. For one child, that might be decoding; for another, it's building fluency or vocabulary acquisition. If we want all our children to be able to read in the richest sense—with the full brain engaged—we need to provide our teachers with the sophisticated tools and knowledge that will allow them to deliver daily individualized, targeted instruction to each child.

Struggling Readers Need Individualized Support

Emergent readers, especially those who are struggling, need great classroom teachers—knowledgeable and skilled practitioners who can support and encourage them. To get this type of extra practice that some learners require, we must leverage technology-based reading instruction that can be personalized to each student's particular needs. Before-and-after brain scans suggest that important changes are taking place in brain activity when struggling readers are given effective reading instruction that is properly targeted to their individual patterns. Put simply, their brains begin to process text more like those of strong readers. Using a tech-based reading program, teachers are able to gather information about individual students' needs and give each student the deliberate practice time on the skills needed most. This not only provides crucial repetition that is necessary for retention, but it frees teachers to spend their time on other aspects of reading instruction, such as holding rich conversations about texts, helping students choose just-right books, and modeling good reading skills.

Neuroscience has brought new and exciting possibilities for the way we teach reading. It has shown us how truly unique each brain is and how very important it is to differentiate reading instruction to meet the needs of every young learner. Using the insights of neuroscience, we can reimagine the way we teach young learners to read, and put all our students on the path to reading proficiency.

Closing the Gap Before It Begins

Join 10 leaders, scholars, and researchers in education as they confront one of the most critical issues in America: disparity in academic achievement.

This 5-part series will challenge business as usual, rekindle the focus on early literacy development, and examine how we can elevate reading proficiency and put all of our students on a measurable path to college and career readiness.

Follow this 5-Part Series on Foundational Literacy at [iRead.com](https://www.iRead.com)

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Marian Wright Edelman



John Engler

Part 1: Meet the Class of 2025
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The state of America's first graders is more critical than ever. We must act in new ways to help these children succeed.

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Dr. Marilyn Adams



Francie Alexander

Part 2: A Vaccine to Prevent Third-Grade Retention
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If prevention is worth a pound of cure, then let's give our primary students instruction that identifies, monitors, and addresses their learning needs from the outset.

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Dr. Ted Hasselbring



Margery Mayer

Part 3: Technology: The Great Equalizer
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Class sizes are on the rise, and teachers need support to individualize their instruction. There is a proven algorithm to build mastery and achieve success.

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Dr. Julie Washington



Dr. Elsa Cárdenas-Hagan

Part 4: Turning Challenges Into Strengths
by Dr. Julie Washington & Dr. Elsa Cárdenas-Hagan

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How do we serve the language development needs and close the word gap for students from culturally and linguistically diverse backgrounds?

MEET THE AUTHORS

*Dr. Anne Cunningham is an Associate Professor of Cognition and Development at the University of California, Berkeley. Her research on literacy and development has been supported by agencies such as the National Institute of Health (NIH), National Science Foundation (NSF), and the U. S. Department of Education Institute for Educational Studies (IES), and she has served on numerous state and national committees surrounding literacy development and instruction.

**Dr. David Rose is a developmental neuropsychologist, educator, and cofounder of CAST, a not-for-profit organization that improves education for all learners through innovative use of technology and research in the cognitive neurosciences. Dr. Rose has been on the faculty of Harvard's Graduate School of Education for more than 25 years and has authored several scholarly books and articles, and numerous award-winning educational technologies.

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