The Science of Reading: Why All The Fuss?

Agenda

- Alternative views about word reading
- How skilled readers read
- What is the science of reading?
- Key Insights from scientific studies

Key Presentation Resources

- Essentials of Assessing, Preventing, and Overcoming Reading Difficulties
  By Kilpatrick
- Equipped for Reading Success
  By Kilpatrick
- Reading in the Brain
  by Dehaene
- Language at the Speed of Sight
  By Seidenberg

Skilled Readers

According to David Kilpatrick:

- Instantly and effortlessly recognize known words
- 1/20th of a second
- Read 150-200 words per minute
- Immediately recognize 30-70K words
- Learn new words very quickly
- Remember words they’ve learned

Kilpatrick, D., Equipped for Reading Success: A Comprehensive, Step-by-Step Program for Developing Phonemic Awareness and Fluent Word Recognition. (Casey & Krisch, 2016) p 4
3 Views About Word Reading

**Agreement**

**WHAT** skilled reading looks like

**Disagreement**

The disagreement is **HOW** to get there

**3 Views**

1. Readers make sense of print with cues from the text
2. Recognizing words is a visual task – word memory
3. Word identification requires a phoneme-grapheme approach

Phonics vs. 3 Cueing System

**Phonics**

- Teaches patterns to build sight bank
- Encourages sounding out of unfamiliar words

**3 Cueing System**

- Encourages students to use context to guess words

---

"In contrast to skilled readers, weak readers rely heavily on context for word reading... This is likely due to their limited pool of familiar words, as well as their poor phonic decoding skills."

"Some research suggests that with weak readers, contextual guessing actually hinders word learning (Landi et al., 2006). If weak readers can correctly guess a word from context, they do not have to carefully notice the letter sequence of that word to assist them in making it a familiar sequence for later recognition."

---

“Learning with the whole word method is much slower and trains the wrong brain area in the right hemisphere. Systematic grapheme to phoneme correspondences has the upper hand in making the fastest change.”


Reminder!
Some educational practices are based on belief systems -- NOT science.
Whole Word Reading is a Myth

“As adults we have forgotten how we were as children. The adults have the illusion of whole word reading but the brain processes every single letter and does not look at the whole shape.”

Buster


Word recognition requires a phoneme-grapheme approach

Torgesen on Fluent Reading

“The most important key to fluent reading of any text is the ability to automatically recognize almost all of the words in the text.”

(Torgesen et al., 2003, p. 293)

Definition of Sight Word

For this presentation, a **sight word** is a word that an individual can instantly and effortlessly recognize without sounding it out.
Size of Sight Word Vocabulary

Think About the Impact on Fluency and Comprehension

Reader A
- integrity
- eloquent
- remedy
- indemnify
- recognize
- prompt
- identify
- testimonial
- articulate
- efficient

Reader B
- miniscule
- the

How Are Words Learned?

New word

Familiar word patterns are stored in a reader’s mind.

Exposures Required

How many exposures does it take?

For typical developing readers,
1. Display
2. Display
3. Display
4. Display

It takes 1 to 4 exposures

Phonemes are Anchors

\( /j/ /u/ /m/ /p/ \)

\( j \ u \ m \ p \)

“Phoneme skills are needed for BOTH sounding out new words AND remembering the words we read.”
Building Language Knowledge

“Every time we read we update our knowledge of language. At a conscious level we read a text for its content: because it is a story or a textbook or a joke. At a subconscious level our brains automatically register information about the structure of language.”

Skilled readers:
• Know more about language structures
• Know about words that occur in print but not speech
• Have greater background knowledge

Based on Seidenberg (2017). p 82

Orthographic Statistics

Skilled readers have learned to:
• Identify the legal patterns of letters that are used frequently (THR, STP, etc.)
• Recognize strings of letters that cannot occur in English (for example, TSIP, SITP, XPLK)
• Build neural structures that represent the permissible patterns
• Tune the structures every time a text is read

Reading Practice

“Reading progress cannot be accelerated unless readers develop the ability to quickly add words to their sight vocabularies.”

Decodable Text

Once a student knows a pattern, he/she must practice seeing that pattern in reliable text

Decodable text:
• Allows students to practice phonic patterns that have been taught
• Transitions students from seeing the pattern in isolation to seeing it in text
“Orthography refers to our knowledge of the correct way to write words.”


“Readers become orthographic experts by absorbing a lot of data, which is one reason why the sheer amount and variety of texts that children read is important...The path to orthographic expertise begins with practice, practice, practice but leads to more, more, more.”


Orthographic Memory

Focus in this presentation:

- Recognize the Word
- Spell the Word

Sight Vocabulary = the pool of words recognized without sounding out or guessing

Orthographic Mapping

- Occurs when students connect sounds with spellings of words
- Creates a memory for known word patterns
- Creates a base of chunks that are not easily read letter by letter: ould, ing, tion

Mapping patterns to memory is essential for fluent word reading.
Mapping Sounds to Letters

Readers use the *pronunciations* of words already stored in LT memory as anchoring points for *letters* used to represent the pronunciations

- Step 1 – attach phonological sound in memory to letters
- Step 2 – anchor the sequence of letters in memory

Where Reading Takes Place in the Brain

Scientific Studies about Reading

Brain Imaging Technologies

PET Technology (Positron Emission Tomography)

- Inject volunteers with radioactive water
- Spreads through body in bloodstream
- Accumulates where blood flow is fastest (shown in yellow and red)
- Reflects brain’s “hot spots”

Brain Imaging Technologies

fMRI and MEG
(and other more recent technologies)

- Watch the time course of reading a word
- Starts in the back of the brain where the letters are processed
- Moves to the phonological and meaning areas

Dr. Stanislas Dehaene

Video: How the Brain Learns to Read, by Professor Stanislas Dehaene – World Innovation Summit for Education (WISE), October 25, 2013

https://www.youtube.com/watch?v=25Gt3-k3do
Start at 3:27 and end at 4:13
The Science of Reading: Why All The Fuss?

**Brain Architecture**

“Our brains were hardwired for speaking, not reading. We “recycle” the part of the brain (visual word form area) where we recognize faces and objects and substitute it for letters and sounds. As the faces and objects move to the right side of the brain, an interface must be created between vision and language systems.”

Dehaene, S. How the Brain Learns to Read
https://www.youtube.com/watch?v=25GI3-kiLdo.5:58

**Reading Words Requires Connections**
(according to DeHaene)

Connections Between Letters and Sounds and Meaning

Dehaene, S. 2017. How the Brain Learns to Read
https://www.youtube.com/watch?v=25GI3-kiLdo.6.08

**Science of Reading**

...Has Come a LONG Way in 30 Years

Brain Research Methods Not Available Until Recently

“Empowering teachers with... appropriate knowledge... will change classroom practice.”

Dehaene, S. 2017. How the Brain Learns to Read
https://www.youtube.com/watch?v=25GI3-kiLdo.1:08, 2:01
Beliefs vs. Facts

Beliefs ↔ Facts

“A look at the basic science suggests specific ways to promote reading success… What they require is changing the culture of education from one based on beliefs to one based on facts.”


The Great Divide

“There is a profound disconnection between the science of reading and educational practice. Very little of what we’ve learned about reading as scientists has had any impact on what happens in schools…”


Science Classroom Practices

Gulf Between Science & Practice

Reading Science

Reading Instruction

“The gulf between science and education has been harmful. A look at the science reveals that the methods commonly used to teach children are inconsistent with basic facts about human cognition and development and so make learning to read more difficult than it should be.”


Questions?

shall@95percentgroup.com

www.95percentgroup.com

Twitter: @susanhall_edd