Recent Advances in Understanding How Students Remember the Words They Read and Why So Many Struggle

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Related Resources
On Important Topics I Will Not Cover

Vocabulary and Reading Comprehension:

Students for whom English is a non-native language:

Resources for Scientifically-Based Information on Reading
- IES Practice Guides (U.S. Department of Education)
  - Foundational Skills to Support Reading for Understanding in Kindergarten Through 3rd Grade
  - Assisting Students Struggling with Reading: Response to Intervention (RTI) and Multi-Tier Intervention in the Primary Grades
- The Reading League
  - Website - Live Events
  - The Reading League Journal
- International Dyslexia Association
  - Perspectives on Language and Literacy
  - IDA Examiner
  - Annals of Dyslexia
- AMP Educate reports with Emily Hanford
  - www.ampreports.org/reading
Key Terms to Understand this Presentation

- Auditory vs. phonological
- Phonological vs. phonemic
- Orthography and orthographic
- Phonological awareness vs. phonics
  - Many balanced literacy and phonics advocates aren’t clear on this
- Decoding
  - Phonic decoding and word-level reading
- “Sight word” and sight word vocabulary
  - Also called orthographic lexicon

Introducing the Field of the Scientific Study of Reading

- Huge field
  - Approximately 650 to 800 new empirical articles appear in English (the international language of science) every year!

- Heavily grant funded
  - Tens of million of dollars each year in the U.S. alone (i.e., apart from the $13-$15 billion on general & special educational remediation)

- Many niche areas within the broader reading research enterprise

The Gap Between Research and Practice

- Studies show this gap exists in multiple fields
  - Literacy education
  - Early education
  - Special education
  - Educational administration
  - School psychology
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An Important Note About Poor Word Reading and Dyslexia

- Researchers do not distinguish between “dyslexia” and “poor word reading” (with caveats)
  - That’s based upon popular lore over the last 100+ years
- Researcher Definition:
  - Word-level reading difficulty despite adequate opportunity, effort (not due to blindness, deafness, emotional disturbance, or low IQ)
  - October 2017 boost from the chair of the UK Reading Panel
  - A problem translating research to practice:
    - Where do we draw the line?
  - Relationship to IDEA in general
    - Cuts across many disability categories

The Phonological–Core Deficit of Dyslexia (i.e., the cause(s) of poor word reading despite the caveats)

- From the “most common cause” to the “universal cause”
- Weakness in one or more of the following:
  - Phonemic awareness/analysis
  - Phonemic blending/synthesis
  - Rapid automatized naming
  - Phonological working memory
  - Nonsense word reading, letter–sound knowledge acquisition
    - (Typically more than one of these, sometimes all of them)
- Very well established with no substantive alternatives
The Alphabetic Principle

- Consider the difference between Chinese writing vs. alphabetic writing
- We do not write words!
  - We write sequences of characters designed to represent sequences of phonemes in spoken words
- Alphabetic writing involves phoneme-based characters
- Poor cognitive access to the phonemes makes reading alphabetic languages very difficult
- Phoneme skills are needed for BOTH sounding out new words AND remembering the words we read
  - Recall that we do not remember words by visual memory!

To properly assess word-level reading difficulties, we need a CRASH COURSE ON HOW WORDS ARE LEARNED

What is YOUR Theory About How We Remember the Words We Read?

**Fundamental assumption:**
*We all do the best we can with what we know*
- My first 9 years as a school psychologist & first 4 years teaching courses in learning disabilities and educational psychology
The Four Classic Reading Approaches

- Clear delineation between them based on the instruction’s unit of focus
- Teachers may sample strategies from multiple approaches
- They fall along a continuum of unit size
  1. Letters/graphemes – phonics approach
  2. Word parts/rime units – linguistic/word family approach
  3. Words – whole word approach
  4. Sentences/paragraphs – whole language/balanced literacy

In every study I’ve seen, one has the best results
In every study I’ve seen, one has the weakest results
What they share in common
- None adequately addresses both levels of word-level reading

Contextual
- Skilled readers recognize most of the words they read
  - Context is required for meaning, not for recognizing familiar words
  - Skilled readers are good at sounding out new words
  - This is tremendously more reliable than guessing
- Poor readers 1) know do not recognize most of the words they read and 2) are not good at sounding out words, so they must rely on guessing from context

Syntactic/Grammatical
- Required for meaning, but virtually uncorrelated with word reading

Grapho-phonics
- Refers to sampling letters, not sounding out words phonically
- Skilled readers effectively sound out unfamiliar words with help from set for variability and contextual facilitation (90%–98% accuracy rate)
- By contrast, guessing is ineffective (8% to 25% accuracy)
Sight Word Vocabulary is NOT Based on Visual Memory/Visual Skills

- Input and storage are not the same thing
- Input is visual, storage is orthographic, phonological, & semantic
- Cattell’s findings in 1886
- Findings from the 1970s
  - Correlation between word reading & visual memory: zero to weak
- 1960s to 1980s mixed case studies
  - Adams’ comment about debating with students
  - Kevin reading Calvin & Hobbes
  - Our “abstract representation” of every letter
  - If a first grader learns “bear” he can instantly identify “BEAR”
  - Consider all the fonts and personal handwriting we read

Word reading correlates strongly with phonological skills
- Phonological awareness & Word Reading: \( r = .5 \) to \( .7 \)
- Note how we sometimes “block” on names of people and things (visual memory), but never written words
- Most students who are deaf struggle tremendously with word-level reading
  - This should not be such a problem if word reading was based on visual memory!

Neuroimaging studies since 2000 show that
- 1) phonic decoding;
- 2) instant word recognition;
- 3) memory for faces; and
- 4) object naming

\emph{are all processed in different areas/sub-systems of the brain!}
(Cattell’s findings from 1886 now make sense)
Three levels of response to phonics based upon the severity of the phonological-core deficit

- Severe
- Moderate
- Mild

Level of Severity of the Phonological-Core Deficit

How Sight Vocabulary is Developed
An Introduction to Orthographic Mapping

A Common Misconception About Reading: "Children Learn to Read in Different Ways"

- This confuses teaching and learning
- We teach things they don’t learn; they learn things we don’t teach!
- We TEACH reading in different ways; they LEARN to read proficiently in only one way
- Teaching is what we do—learning is what their brains do
- It’s amazing there’s even one way our brains read so efficiently
  - Perceive words in 1/20th of a second
  - Read 150-250 words a minute
  - Have 50,000 to 70,000 words in our instant, orthographic lexicon
  - Add new words to that lexicon after 1 to 4 exposures
- There are not 2, 3 or 4 ways our brain is set up to do that!
- All skilled readers have the same basic skills
  - All skilled readers can read nonsense words, even if not taught phonics
  - All skilled readers have large and continuously expanding sight vocabularies
**David Share’s Self-Teaching Hypothesis**

- We teach ourselves most of the words we know.
- Orthographic learning occurs one word at a time.
- Orthographic learning is implicit – typically does not involve conscious thought or effort.
- As students sound out words, they are forming orthographic connections.
  - When new words are not sounded out, they are poorly remembered.
- From 2nd grade on, typically developing readers remember words after only 1 to 4 exposures.

**Linnea Ehri’s Orthographic Mapping Theory**

- Sight words are highly familiar spellings (i.e., letter sequences), regardless of the visual look of the word.
  - e.g., bear, BEAR, Bear, Bear, Bear, Bear, Bear.
- Sight words are anchored in LTM via a connection between something well established in LTM (the word’s pronunciation) and the stimulus that needs to be learned (the letter sequence in the word’s spelling).
- Phonemic segmentation and letter-sound skills are central to this connection-forming process.

**How We “Map” Words**

“Transparent” Words

(i.e. words with one-to-one correspondence)

- PLTM
- Phoneme Awareness/Analysis
- Phonoeme Blending
- Letter-Sound Knowledge
- Orthographic Mapping
- Self-Teaching Hypothesis

- /red/  
  - /r/ /e/ /d/  
  - Oral First: A mind prepared to store words
  - Phonological LTM Activation

- /haz/  
  - /h/ /a/ /z/  
  - Phoneme Awareness/Analysis

- /drift/  
  - /d/ /r/ /f/ /t/  
  - Orthographic Mapping

Self-Teaching Hypothesis
How We “Map” Words

Words that are “Opaque”
(i.e. words without a one-to-one correspondence)

/m/ /æ/ /k/
m a k e
/l/ /æ/ /d/
 r e a d
/c/ /ɛ/ /m/
 c o m b

Orthographic Mapping

- Orthographic mapping is the mental process we use to turn an unfamiliar written word into an instantly accessible, and familiar “sight word”

- Orthographic mapping requires:
  - Letter-sound proficiency
  - Phonemic proficiency (this goes well beyond what is tested on our universal screeners)
  - The ability to establish a relationship between sounds and letters unconsciously while reading

- Orthographic mapping develops naturally in about 60%-70% of students via exposure to literacy activities
  - Most students learn to read regardless of how they were taught

What about irregular words?

- Irregular words only take a few extra exposures to learn
- Most irregular words are off by only one element
  - (said, put, comb, island; multiple violations are rare: one, iron)
- Many regular words require mapping “adjustments” like irregular words
  - Silent e words, vowel digraphs, consonant digraphs are all opaque
  - Multisyllabic “regular” words with vowel reduction require mapping adjustment, much like irregular words (e.g., holiday, market)
- Irregular words not a challenge for orthographic mapping
  - “Exception words are only exceptional when someone tries to read them by applying a [phonie] decoding strategy. When they are learned as sight words, they are secured in memory by the same connections as regularly spelled words . . .” (Ehri, 2005 p. 171-172)
Effective Use of Flash Cards
From the Perspective of Orthographic Mapping

- Introduce the word orally first
- Segment into phonemes verbally (no letters)
- Emphasize each phoneme
- Ask for letters associated with phonemes
- Build a “phonological framework”
  - Focus first on regular letter-sound connections
  - Elaborate if possible
- Then work that word into a stack of flash cards

What Determines Reading Fluency?

- The NRP only defined fluency (speed, accuracy & prosody) but did not explain what determines fluency
- The elusive key to reading fluency is:
  **SIGHT VOCABULARY SIZE**
  - With a large sight vocabulary:
    Most (or all) words “pop out”; reading is fast and accurate
  - With a limited sight vocabulary:
    Reading is effortful and not fluent
- Conclusion: Fluency is a BY-PRODUCT of a large and ever expanding sight vocabulary – it is not a separate reading-related skill independent of other word reading factors

The Development of Word Reading Based on Phonological Skills

*Phonology: The Foundation of Alphabetic Writing*
**Summary**

- Memory for written words is based on orthographic memory not visual memory.
- Guessing based on context is an inefficient and unreliable word identification strategy used by weak readers, but not skilled readers.
- Skilled word-level reading requires good phonemic skills and good letter-sound skills.
  - This is due to the phonemic nature of our alphabetic writing system.
- All skilled word readers are good at phonic decoding and orthographic mapping (remembering words) while weaker readers are weak in both.
  - Phonics skills are essential, but not enough.
  - Skilled readers have large sight vocabularies, weak readers do not.
- Fluency is largely a function of sight vocabulary size.
- There is an interactive, reciprocal relationship between phonological skills and letter-sound skills in word-reading development.