Recent Advances in Understanding Word-Level Reading Problems: Implications for Instruction and Effective Intervention

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Today’s Three Objectives

1. Understand “sight vocabulary” development & fluency
2. Understand why some students struggle
3. Learn the “elusive” research based reading interventions

- My real goal is to “whet your appetite” to embark on a course of self-study so you can become a “conduit” of empirical reading research to your schools.
Key Terms to Understand this Presentation

- Auditory vs. phonological
- Phonological vs. phonemic
- Orthography and orthographic
- Phonological awareness vs. phonics
- Decoding
  - Phonic decoding and word-level reading
- Sight word and sight word vocabulary
  - Also called orthographic lexicon
Multiple definitions – organizations and popular

Researcher Definition:
Word-level reading difficulty despite adequate opportunity and effort
(all else is popular lore that’s been with us for over 100 years)
• In October 2017 it got a boost from the chair of the UK Reading Panel

A problem translating research to practice: where to draw the line

Relationship to SLD in IDEA
Relationship to IDEA in general
◦ Cuts across many disability categories
The Phonological–Core Deficit of Dyslexia

- 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
- Very well established with no substantive alternatives

1) *Kids who are average or better in all of these do not have dyslexia!* (so long as the PA assessments are sensitive)
2) *We don’t find poor word readers without one or more of these characteristics*
To understand highly effective prevention and intervention, we need a **CRASH COURSE ON HOW WORDS ARE LEARNED**
What is YOUR Theory About How We Remember the Words We Read?

• We all have a theory, but you may not know yours
  • If you can’t think of yours, just work backward from any interventions you use or recommend
• Our instruction focuses on on READING words, not on LEARNING words
Two Levels of Word-level Reading Skill Deficits

What distinguishes skilled word readers from poor word readers?

1) The ability to identifying unfamiliar words by sounding them out
2) The ability to remember the words they read
The Alphabetic Principle

• Chinese writing vs. alphabetic writing

• We do not write words!
  • We write sequences of characters designed to represent sequences of phonemes in spoken words

• Poor 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
Theories of Word-Level Reading

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
Theories of Word-Level Reading

1) Three-cueing systems approach
   • Actually a theory about getting meaning from print
   • But has a lot to say about identifying words
   • Developed in the 1930s–1940s updated in the 1960s
     • No real change since the 1960s despite over 40 years of research
   • Previously called the *psycholinguistic guessing game*
   • Central to whole language, balanced instruction, MSV, literacy-based approach; the foundation for LLI & Reading Recovery

2) Visual Memory Hypothesis
   • Whole word approach, flash card approach, repeated readings; even incorporated into the phonic approach
     • It’s the phonic approach to irregular words and word memory

3) Phonics
   • Also called the “code-based approach” & “structured literacy approach”
Poor Readers, not skilled readers read based on the “Three–Cueing Systems” Approach

**Contextual**
- Skilled readers recognize most of the words they read. Context is not required to recognize familiar words.
- Poor readers know fewer words so they rely on context.

**Syntactic/Grammatical**
- These skills are virtually uncorrelated with word reading.

**Grapho–phonic**
- Skilled readers effectively sound out unfamiliar words with help from set for variability (80% accuracy rate)
- Poor readers are weak in phonic decoding and have to rely on contextual guessing (25% accuracy).
Sight Word Vocabulary is NOT Based on Visual Memory/Visual Skills

- Our intuitions fail us here
- 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
  - RD (only) kids have equivalent visual memory to non-RD
- 1960s to 1980s mixed case studies
  - Adams’ comment about debating with students
  - Kevin reading Calvin & Hobbes
  - If a first grader learns “bear” he can instantly identify “BEAR”
  - Consider all the fonts and personal handwriting we read
  - Our “abstract representation” of every letter
Sight Word Vocabulary is NOT Based on Visual Memory/Visual Skills

- Word reading correlates strongly with phonological skills
  - *Phonological awareness & Word Reading: r = .30 to .85;*
  - Usually .5 to .7 depending on which PA test (more later)
  - *Visual Memory & Word Reading: r = .1 to .2*
- 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

are all processed in different areas/sub-systems of the brain!

(Cattell’s findings from 1886 now make sense)
Concerns About the Efficacy of Phonics

- Explicit and systematic phonics instruction displays superior results than whole word or whole language (three cueing, guided reading, balanced instruction)
  - This is true for all children but results “wash out” in the top half to two thirds of students by 3rd to 4th grade
  - Bottom third show ongoing benefit over time
- Too many, however, never “catch up”
- A small percentage cannot seem to learn via phonics
- No built-in mechanism or theory about fluency and building a sight vocabulary
Concerns About the Efficacy of Phonics

- Three levels of response to phonics based upon the severity of the phonological-core deficit
  - (And you know all these students!)
Comments on All Three Approaches

- They form the basis of today’s instruction and intervention
- All have equally enthusiastic advocates
- All have too high a “failure rate”
  - Phonics has the lowest failure rate, but still too high
- Remediation is more intense version of the same
  - As if something that doesn’t work will work better if delivered more intensively
- None can accurately describe why students struggle
- None addresses “memory” for words
- Why these issues?

Because all were developed long before the last 40 years of scientific findings about reading
How Sight Vocabulary is Developed
An Introduction to Orthographic Mapping
The Science of Remembering Written Words

- Orthographic learning
  - How we remember the words we read
  - Instant effortless access to words
  - Building the orthographic lexicon

- Orthographic learning research
  - Computational/computer models
    - Multiple competing versions
  - Cognitive/behavioral models
    - Ehri’s theory of sight word learning (orthographic mapping)
    - Share’s theory of word learning (self-teaching hypothesis)
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 newly encountered words are not sounded out, they are poorly remembered
- From 2nd grade on, typically developing readers remember words after only 1 to 4 exposures
Orthographic mapping is the mental process we use to store words for immediate, effortless retrieval.

In other words, orthographic mapping is what we do to make an unfamiliar written word into an automatic “sight word.”
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, bear, BEAR

- Sight words are anchored in long-term memory (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

Phonological LTM Activation

Phoneme Awareness/Analysis

Letter-Sound Knowledge

Orthographic Mapping

Self-Teaching Hypothesis

Oral First: A mind prepared to store words
How We “Map” Words

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

/m/ /ā/ /k/  /r/ /ē/ /d/  /c/ /ō/ /m/
make  read  comb
What about irregular words?

- Irregular and opaque words take longer to learn
  - Only 1–2 extra exposures for typical readers; many more for RD
- Most irregular words are off by only one element
  - (said, put, comb, island; multiple violations are rare: one, iron)
- Irregular words not a challenge for orthographic mapping
  - “Exception words are only exceptional when someone tries to read them by applying a [phonic] 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)
What about irregular words?

- 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 are not the cause of reading problems in English
  - Even very regular orthographies (e.g., Italian, Spanish) have RD, and their RD is based upon poor orthographic mapping
  - It makes English phonic decoding harder to learn, but these irregularities are not the cause of poor sight word reading
  - Even regular words are poorly represented in the orthographic lexicons of poor readers
How Words are Learned for Instant, Effortless Retrieval

- 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 60%–70% of students via exposure to literacy activities
  - Most students learn to read regardless of how they were taught
The Developmental Relationship Between Phonological Skills and Word-Level Reading

Phonological Skill Development

1. Early Phonological Awareness
   - Rhyming, first sounds, syllable segmentation

2. Basic Phoneme Awareness
   - Blending and segmentation

3. Advanced Phonemic Awareness/Proficiency
   - Automatic, unconscious access to phonemes in spoken words

Word Reading Skill Development

1. Letter Names and Letter Sounds
   - Phonological storage and retrieval

2. Phonic Decoding and Encoding (Spelling)

3. Orthographic Mapping
   - Efficient memory for printed words; rapid sight vocabulary expansion
Sight Vocabulary and Reading Fluency

- *Sight words* are effortless & pre-cognitive—words “pop out”
- 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 often inaccurate because too many unfamiliar words require attention and strategic decoding
  - Poor fluency is NOT about speed of access to known words
The “Path” to Fluent Word Reading

- **Word reading fluency** is primarily based on the . . .
- Size of the *sight vocabulary/orthographic lexicon*, which is based on . . .
- How skilled a student is in remembering words (*orthographic mapping skills*) combined with reading experience, and orthographic mapping is based on . . .
- **Letter–sound proficiency**/automaticity (unconscious access to the sounds letters represent) AND
- **Phonemic proficiency**/automaticity (unconscious access to phonemes in spoken words)
- This latter skill is a universally missing element
- (Develops in typical readers, but not in struggling readers)
PREVENTION AND INTERVENTION
The problem with the term “research based”

No Consumer Reports–style opportunity exists
  ◦ What Works Clearinghouse, bestevidence.org, etc. have major problems
    • Use of effect size to determine efficacy
    • Very limited number of studies for any given program

The National Reading Panel (NRP) avoided this by focusing on principles and approaches, not programs

IES Practice Guides focus on principles and approaches

There is no substitute for well–informed educational professionals
  ◦ Analogy of carpenter and tools
Role of Socio–Economic Factors

- Socioeconomic Status (SES) is moderately correlated with reading outcomes
  - But correlation does not mean causation

- Effective instruction and intervention have been shown to be highly effective with low SES students
  - However, reading comprehension (RC) difficulties may continue
    - Yet word reading no longer compromises reading comprehension, so there are RC improvements

- Often blame is misplaced – inadequate instructional philosophies and practices get conflated with low SES
English Language Learners

- Hundreds of studies with consistent findings
  - Findings support the Simple View of Reading
  - Word reading develops similarly to native speakers (in the absence of the phonological–core deficit)
  - Perhaps brief time lag, depending on age, previous reading acquisition, similarities across languages, etc.
  - PA transfers across languages
  - Comprehension lag (5–6 years) due to language development
Prevention: Tier 1 Results
K–1 phonological Awareness Instruction

- Overall improvement in reading scores
- Average of 8 standard score points
- Results did not always last after 1–2 year follow ups

HOWEVER . . .

- At-risk students averaged 13 standard score point gains!
- Gains increased to an average of 20 points at 6 month to 2 year follow ups!
I. Prevention of Word-Level Reading Difficulties

- Tier 1 instruction – What is effective K–1?
  - KEY COMPONENTS
  - Phonological Awareness
  - Letter–Sound Knowledge
  - Connecting phonological awareness to word–level reading
  - Good teaching techniques based on general learning principles
    - Seems to be the focus of RTI efforts

- Early, rigorous development of PA and LS skills in K–1 dramatically reduces the number of struggling readers

- Quick Survey:
  - How many of you work in schools that have a formalized, systematic, whole class, Tier 1 PA training in K–1?
A Recent Finding about Intervention Research

- Numerous reviews of intervention research and meta-analyses have been conducted since 1999.
- They routinely look at the obvious factors:
  - Socioeconomic Status (SES)
  - Age of students (e.g., 2nd graders vs. 5th graders vs. 9th graders)
  - Length of intervention (e.g., 35 hours? 65 hours? 110 hours?)
  - Group size (e.g., 1:1? 1:3? 1:5? 1:8? whole class?)
  - Severity of problem (2nd percentile? 10th? 20th? 30th?)
- Contrary to the expectations, the first two show small effects and the other three show no consistent effects.
  - SES showed much impact with reading comprehension, however.
A Recent Finding about Intervention Research

- Using standard scores to determine effectiveness
- This results in three groups of intervention results
  - *Minimal results group:* 0 to 5 standard score improvements
    - Mostly 2–4 points
  - *Moderate results group:* 6 to 9 standard score improvements
    - Mostly 6–7 points
  - *Highly successful group:* 10 to 25 standard score point improvements
    - Mostly 14–17 points
These three groups approached instruction differently!

- **Minimal Group (0 – 5.85 SS improvements)**
  - None formally trained phonological awareness/analysis
  - Most did explicit, systematic phonics
  - All provided reading practice with connected text

- **Moderate Group (6–9 SS improvements)**
  - All did explicit, systematic phonics
  - All provided reading practice
  - All trained phonological segmentation and/or blending
    - This is “basic phonological awareness” (mastered by most at end of 1st grade)

- **Highly Successful Group (10–25 point improvements)**
  - Aggressively addressed and “fixed” PA issues using advanced PA training
  - All did explicit, systematic phonics
  - All provided reading practice with connected text
Summary

- Word-level reading is primarily phonological
- This is based upon the alphabetic nature of our writing system
- Visual skills not a source of reading problems
- Skilled readers are all good at phonic decoding and orthographic mapping – neither is optional
- Fluency is a function of sight vocabulary size
  - And a few other smaller contributors
- Reading problems are very preventable
- The most highly effective word–reading intervention outcomes trained advanced phonemic awareness, letter–sound skills, and did reading practice