

The Science of Written Word Learning

Implications for Instruction and Intervention

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Today's Objectives

- 1 Understand the nature of word-level reading
- 2 Develop a laser focus on the two levels of word reading; (1) identifying new words, and (2) remembering words
- 3 Learn the key skills needed for proficient word reading
- 4 Understand why some struggle in word reading
- 5 Learn about the instructional/intervention approaches with the best results in the scientific research literature

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Related Resources

Important Topics I Will Not Cover as Much

Vocabulary and Reading Comprehension:

Beck, I. L., McKeown, M. G., & Kucan, L. (2013). *Bringing Words to Life: Robust Vocabulary Instruction* (2nd ed.). New York, NY: Guilford Press.

Oakhill, J., Cain, K., & Elbro, C. (2015). *Understanding and Teaching Reading Comprehension: A Handbook*. New York: Routledge.

Students who are non-native speakers of English:

Geva, E., & Wiener, J. (2014). *Psychological Assessment of Culturally and Linguistically Diverse Children and Adolescents: A Practitioner's Guide*. New York, NY: Springer.

Geva, E., & Ramirez, R. (2015). *Focus on Reading (Oxford Key Concepts for the Language Classroom)*. New York: Oxford University Press.

Listening resources:

Emily Hanford from American Public Media. www.apmreports.org/reading

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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

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The Nature of Word Reading in Alphabetic Writing Systems

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The Alphabetic Principle and the Nature of Alphabetic Writing

- 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

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The Two Levels of Word Reading

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Two Levels of Word-Level Reading Skill Deficits

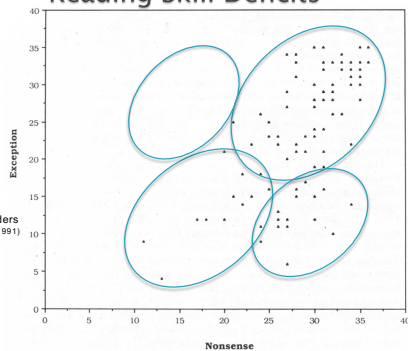
- 1) The ability to identify unfamiliar words by sounding them out
- 2) The ability to remember the words they read

As we will see (and contrary to our intuition), the first level of skill is required for the second

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Two Levels of Word-Level Reading Skill Deficits

Study of 93
1st through 3rd graders
From Gough & Walsh (1991)



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A Question Science Needs to Answer

- ▶ Of the 30,000 to 70,000 words in your orthographic lexicon:
 - What percentage of them, upon first encounter, did you put conscious effort into remembering for the future?
- ▶ Thus, the process of remembering written words is automatic, unconscious, and occurs "behind the scenes" while reading
 - This was not true for the math facts you learned in elementary school, or learning state capitals, or the Spanish or French flash cards you used in high school and college!
- ▶ *This highly efficient memory process requires explanation!*

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The Key Skills Readers Need for Proficient Word-Level Reading

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The Skills Needed for Word-Level Reading

- ▶ Phonetic Decoding (correctly sounding out words)
 - Letter-sound knowledge
 - Oral-phonemic blending
- ▶ Orthographic Mapping (remembering words)
 - Letter-sound proficiency
 - Phonemic proficiency

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Orthographic Mapping

- ▶ The *process* involved in remembering words for later, instant and effortless retrieval
 - Also applies to word parts, not just words
- ▶ Orthographic mapping is the mechanism that builds the sight vocabulary/orthographic lexicon
- ▶ Other than visual input of the letters into the system, it is not a visual memory process

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David Share's Self-Teaching Hypothesis

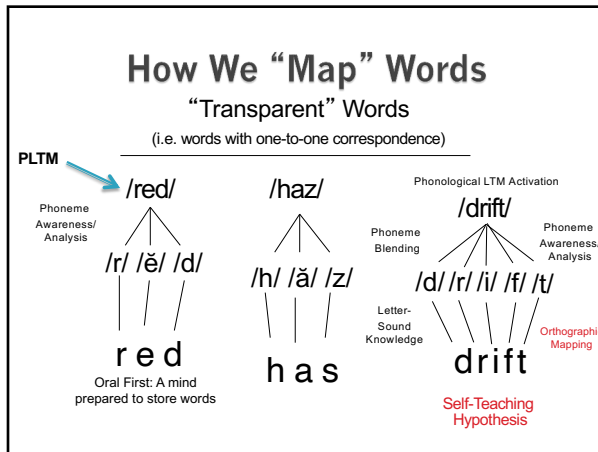
- ▶ We teach ourselves most of the words we know
- ▶ As students sound out new words, orthographic connections are formed
 - When newly encountered words are not sounded out, they are poorly remembered
 - Self teaching does not refer to teaching ourselves "the code," but presumes you know the code and can use it reliably
- ▶ From 2nd grade on, typically developing readers remember words after only 1 to 4 exposures

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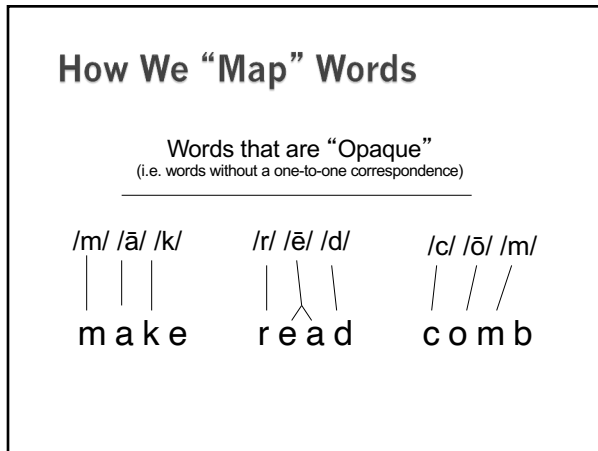
Linnea Ehri's Orthographic Mapping Theory

- ▶ 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 memory via connecting pronunciations to written spellings
 - Oral pronunciation must be pulled apart at the phoneme level for this to happen

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What about irregular words?

- Most irregular words are off by only one element
 - (*said, put, comb, island*; multiple violations are rare: *one, iron*)
- Irregular words are not a challenge for orthographic mapping
 - “Exception words are only exceptional when someone tries to read them by applying a [phonetic] 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)
- 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*)

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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

This helps answer the question posed earlier

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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
- ▶ Then work that word into a stack of flash cards

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Sight Vocabulary and Reading Fluency

- *Sight words* are effortless & pre-cognitive—words “pop out”
- The elusive key to reading fluency appears to be:

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
- *But what about RAN and reading experience?*

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The “Path” to Fluent Word Reading

- **Word reading fluency** is primarily based on the . . .
- Size of the **orthographic lexicon**, which is based on . . .
- How skilled a student is in remembering words (**orthographic mapping skills**) combined with reading experience; 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)

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Why Our Most Popular Reading Approaches Make it Harder to Learn to Read

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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
 - ▶ Teachers may sample strategies from multiple approaches
- ▶ They also fall along a continuum of effectiveness

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Concerns About the First Three Approaches

- The **Linguistic Approach** has a very narrow time band
- The **Whole Word Approach** does not provide skills for independent reading and promotes a highly inefficient way to remember words (i.e., visual memory)
- The **Balanced Literacy Approach** encourages strategies for word recognition that
 - (1) draw attention away from efficiently determining new words via phonetic decoding plus set for variability; and
 - (2) draw attention away from the internal phonemic and orthographic elements essential for remembering words

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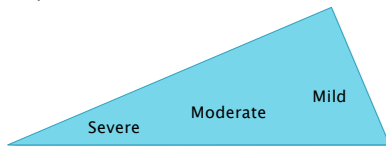
Concerns About the Efficacy of Phonics

- 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 as a group, but results “wash out” in the top two thirds of students by 3rd to 4th grade
 - Bottom third/quarter 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

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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!)



Level of Severity of the Phonological–Core Deficit

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Implications for Screening and Assessment

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Assessment of Word-Level Reading Difficulties

- ▶ Universal screening (e.g., Acadience, DIBELS, Aimsweb, EasyCBM)
- ▶ A more thorough evaluation
 - A follow up to screening results or a referral by teacher or parent
- ▶ Evaluate word-reading skills and the skills that directly influence word-level reading
 - Primary skills to assess:
 - Untimed, context-free word reading (conventional word identification tests)
 - Timed, context-free word reading (TOWRE-2; WIAT-4; KTEA-3)
 - Letter-sound knowledge (conventional untimed pseudoword reading tests)
 - Letter-sound proficiency (timed pseudoword reading; TOWRE-2; WIAT-4)
 - Phonemic awareness and blending (CTOPP-2)
 - Phonemic proficiency (PAST; WIAT-4)

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Assessment of Word-Level Reading Difficulties

- Secondary skills to assess:
 - Vocabulary
 - Affects comprehension, of course, but also word identification test performance via set for variability
 - Rapid Automatized Naming
 - A fairly reliable "marker" of the phonological-core deficit
 - Working memory
 - Another fairly reliable "marker" of the phonological-core deficit

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The PAST Assessment

- ▶ Phonological Awareness Screening Test (PAST)
 - Acronym has double meaning
- ▶ Based on Rosner & Simon (1971)
 - Reworked and improved by McInnis
 - It is "third generation Rosner"
 - CTOPP Elision is "first cousin once removed"
- ▶ Outstanding correlation with reading
 - .6 to .8 elementary students; .5 adults
- ▶ Formed the basis of the WIAT-4 *Phonemic Proficiency* subtest
 - .5 to .6 correlation with word reading at all ages

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The PAST Assessment www.thepasttest.com

- ▶ Not to be confused with another online test with the same acronym
 - "Phonological awareness Skills Test"
- ▶ Based on phonological manipulation
 - Uses segmentation, isolation, & blending
- ▶ Assesses the automaticity of PA
- ▶ Multiple versions for progress assessment
- ▶ Great supplement for CTOPP
- ▶ Requires some training
- ▶ Instructions available on website
- ▶ Free to use
- ▶ Not normed – criterion based

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**PHONOLOGICAL AWARENESS
SCREENING TEST (PAST) FORM A**
David A. McInnis, Ph.D. © 2003, 2010, 2018
Adapted from the book used in McInnis (1999) & Rosner (1971)

Name: _____ Date: _____ Grade: _____ Age: _____
Teacher: _____ D.O.B.: _____ Evaluator: _____

INSTRUCTIONS: See Appendix for Reading Success Chapter 11 "Assessment of Phonological Awareness" for detailed instructions on the PAST.

RESULTS:		Correct		Automatic		Highest Correct Level:	
Basic Syllable	____/12	____/12					(Levels not passed before the highest correct level)
Onset-Rime	____/10	____/10					
Basic Phoneme	____/10	____/10					
Advanced Phoneme	____/20	____/20					
Test Total	____/52	____/52					(One automatic level below highest automatic level)

Approximate Grade Level (Level): PreK 1 2 3 4 5 6 7 8 9 10 11 12 Adult

I. SYLLABLE LEVELS
Basic Syllable Levels (D, E2 - prechecked to mid Underparten, E3 - mid to late Underparten)

LEVEL D Say *bookcase*. Now say *bookcase* but don't say *book*.
INSTRUCTIONS: If you say syllables without starting, stop and start again.

D1 (book)case _____ (on)set _____ onset(s) _____
D2 (case) _____ (on)set _____ onset(s) _____

LEVEL E Say *antelope*. Now say *antelope* but don't say *ant*.
INSTRUCTIONS: If you say syllables without starting, stop and start again.

E1 (ant)elope _____ (on)set _____ (on)set(s) _____
E2 (elope) _____ (on)set _____ (on)set(s) _____
E3 (elope) _____ (on)set _____ (on)set(s) _____

Basic Syllable Total: ____/12 A: ____/12

II. ONSET-RIME LEVELS
Onset-Rime Levels (Underparten to mid first grade)

LEVEL F Say *fast*. Now say *fast* but don't say *f*.
INSTRUCTIONS: If you say syllables without starting, stop and start again.

(f)ast → ast _____ (on)set → off _____
(f)ame → am _____ (f)ame → f _____ (f)ame → am _____

LEVEL G Say *guide*. Now say *guide* but instead of *g* say *u*.
INSTRUCTIONS: If you say syllables without starting, stop and start again.

(g)uide → uide _____ (on)set → off _____ (f)uide → uide _____
(g)ame → ame _____ (f)uide → uide _____ (f)uide → uide _____

Onset-Rime Total: ____/10 A: ____/10

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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

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Intervention Research Results (Tiers 2, 3, 4) Based on Normative Standard Score Improvements

The Phonemic Proficiency Intervention Continuum

Three categories based on outcomes align with three different intervention approaches relative to orthographic mapping!

- ▶ This provides indirect confirmation of the orthographic mapping hypothesis
- ▶ Superb alignment of theory with empirical outcomes
- ▶ Minimal Group (0 – 5.85 standard score point improvements)
 - None formally trained phonological awareness/analysis
 - Most did explicit, systematic phonics instruction
 - All provided reading practice with connected text
- ▶ Moderate Group (6–9 standard score point improvements)
 - All did explicit, systematic phonics instruction
 - All provided reading practice
 - All trained phonological segmentation and/or blending
 - This is “basic phonological awareness” (mastered by most at end of 1st grade)

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Intervention Research Results (Tiers 2, 3, 4) Based on Normative Standard Score Improvements

- ▶ Highly Successful Group (10–25 standard score point gains)
 - Aggressively addressed and “fixed” PA issues—appeared to train phonemic proficiency
 - All did explicit, systematic phonics instruction
 - All provided reading practice with connected text
- ▶ *This is consistent with with the orthographic learning literature*

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Effective Teaching Approaches

Tier 1 and Remedial (Tiers 2, 3, 4)

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How to Promote Orthographic Mapping: General

- Train the skills needed for orthographic mapping
 - Train letter-sound skills to proficiency/automaticity
 - Train phoneme awareness to proficiency/automaticity
 - To a typical 3rd/4th grade level which is essentially the adult level
 - All our universal screenings stop after first grade
- Avoid word identification strategies that may accidentally undermine the development of phonic decoding and orthographic mapping
 - Those with the phonological-core deficit will "default" to the non-phonological strategies, that will not help them with future word identification nor memory for words

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Principles of Effective Instruction

Based on Findings from Inside and Outside Reading Research

- ▶ Instruction must be explicit
- ▶ Instruction should be systematic
- ▶ Adequate practice and immediate feedback
- ▶ Instruction should provide many practice trials
- ▶ Distributed learning better than massed learning
- ▶ Language of instruction must be mastered
- ▶ Motivation is important
 - Keep activities fun, fast paced, brief

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Components of a Reading Lesson Specific Elements

Recall earlier slide:

- ▶ Phonetic Decoding (correctly sounding out words)
 - Letter-sound knowledge
 - Phonemic synthesis/blending
- ▶ Orthographic Mapping (remembering words)
 - Letter-sound proficiency
 - Phonemic analysis proficiency

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Components of a Reading Lesson Specific Elements

- ▶ Phonemic Awareness Instruction/Training
- ▶ Grapheme-Phoneme Instruction/Training (i.e., phonics)
- ▶ Spelling
- ▶ Reading Practice with appropriate words
- ▶ (Reading comprehension related work is constant)

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Components of a Reading Lesson Elements of Lesson

- ▶ Phonemic Awareness Instruction:
 - E.g., First sound in initial blend
- ▶ Phonemic Awareness Training:
 - Reinforce earlier skills with a focus on speed and accuracy
- ▶ Grapheme-Phoneme Instruction
 - E.g., Silent e words
- ▶ Grapheme-Phoneme Training
 - Flash cards, other quick reinforcing activities (see next)
- ▶ Spelling
 - Preplanned and spontaneous words related to the above
- ▶ Reading practice (naturally includes comprehension)
 - Real text reinforcing the lesson
- ▶ Comprehension: vocabulary words from lesson

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Components of a Reading Lesson Sample Activities

- ▶ Introduce words orally first
- ▶ Map rime units
- ▶ Direct Mapping
- ▶ Look Alike Words Technique
- ▶ Backward Decoding
- ▶ Oral Spelling (not supplement, not replace, written spelling)
- ▶ Oral Decoding
- ▶ Irregular Word Reading and Spelling (with prior prep)
- ▶ Nonsense Word Reading and Spelling

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Letter-Sound Learning

- Please sound out these words:
- tuhaykuh
- guhehtuh
- kuhahpuh
- eraykuh

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Pronouncing phonemes in context

- Helps with
 - 1) phonic decoding and
 - 2) doing phonemic awareness
 - 3) letter-sound proficiency
- Vowels
- Voicing
- Easy consonants and consonant digraphs
- Moderately difficult consonants
- Difficult consonants

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Pronouncing phonemes in isolation

- Vowels
- Voicing
- Easy consonants and consonant digraphs
 - *c* (soft), *f, l, m, n, ng, ph, s, sh, th* (voiced), *th* (unvoiced), *v, z, zh*
- Moderately difficult consonants
 - *c* (hard), *g* (soft) *g* (hard) *h, j, k, q, r, w, x, y*
- Difficult consonants
 - *b, d, p, t*

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Summary

- Words are remembered based upon *orthographic memory*, not visual memory
- Orthographic memory is the product of orthographic mapping
- Orthographic mapping requires letter-sound proficiency and phoneme proficiency
- With these two skills intact, the orthographic memory can only be improved via wide reading experiences

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