Linnea Ehri

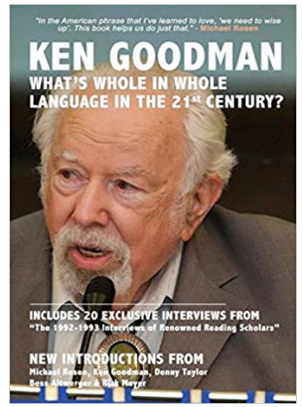
A Personal Historical View of Research on How Children Learn to Read and Spell Words

Distinguished Professor Emerita
Ph.D Program in Educational Psychology
Graduate Center
City University of New York

CUNY Graduate Center

Empire State Building – Midtown Manhattan

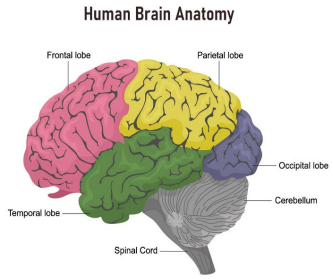
Ken Goodman's Psycholinguistic Theory



- **Reading is a psycholinguistic guessing game…**
- **Efficient reading does not result from precise identification of letters and words**
- **It results from skill in selecting the fewest, most productive cues necessary to produce guesses which are right the first time.**
- **The reader samples graphic cues combined with semantic and syntactic expectations to read text.**
  - Evidence: miscues – misreading *house* as *home, fortune* as *future*

- From "Reading: A Psycholinguistic Guessing Game" by Kenneth Goodman. In Singer & Ruddell, *Theoretical models and processes of reading*. IRA, 1976.

Doubt and Alternative Theory



- **Readers read most words accurately in text**
- **Only a few miscues,**
  - Fewer than 10% otherwise comprehension of compromised
- **Miscues may not reveal how most (90%) of the words are read**
- **Alternative theory:**
  - Read words from memory automatically
  - Spellings become bonded to pronunciations and meanings
  - Spellings stored in the brain
  - No need to guess, or sound out letters to decode
  - Match written word on page to spelling stored in memory

Theories to Explain Reading Words

Theories at that time

- Guessing words from context
- Decoding words by sounding out and blending letters
- Reading visually memorized words: word shapes, letter patterns

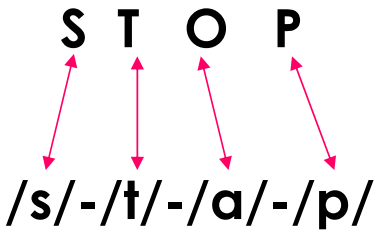
    No systematic link to sounds in words

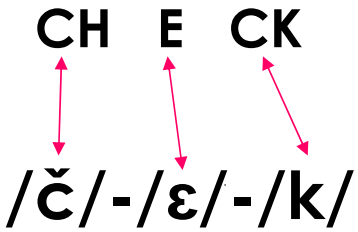
My theory:

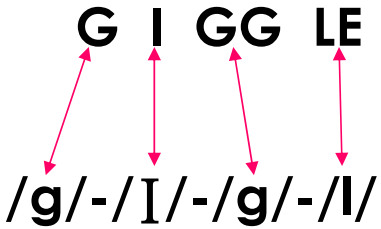
Powerful mnemonic system: grapheme-phoneme relations

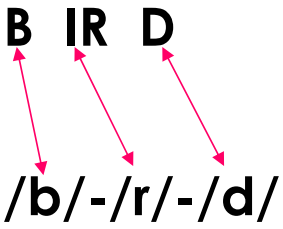
They provide the glue to form connections and store spellings of individual words bonded to their pronunciations in memory.

Orthographic Mapping: Grapheme-phoneme connections to bond spellings to pronunciations in memory









Reader knowledge to form connections:

*Grapheme-phoneme relations

*Phoneme segmentation

International Phonetic Alphabet (IPA) symbols for phonemes

Research Hypotheses Studied

Spellings are stored in memory,

- they become bonded to pronunciations,
- grapheme-phonemes are the units that formed the bonding,
- these bondings are used to read words from memory by sight.

Course of development – alphabetic phases

Pre-alphabetic, when children lack knowledge of letter-sounds

Partial alphabetic, when children know and can use partial letter-sounds to read and spell words but cannot decode

Full alphabetic phase, when children know the major grapheme-phoneme relations and can decode unfamiliar words,

Consolidated alphabetic phase, when students use multi-letter units to read words.

Do grapheme-phonemes connect spellings to pronunciations in memory?

Three learning conditions compared

Connections Taught	**Oral**	**Oral + Spell**	**Oral + Misspell**
The letter P stands for:	“pab”	“pab” PAB	“pab” PES
The letter D stands for:	“des”	“des” DES	“des” DIF
The letter N stands for:	“nif”	“nif” NIF	“nif” NUG
The letter F stands for:	“fug”	“fug” FUG	“fug” FAB

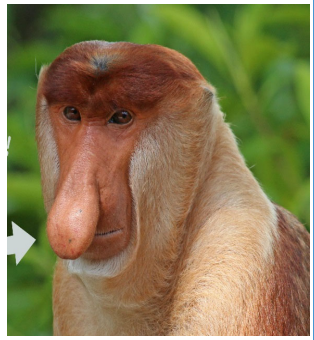
Recall Tested	**Correct Answer**
What does P stand for?	“pab”
What does D stand for?	“des”
What does N stand for?	“nif”
What does F stand for?	“fug”

Ehri & Wilce, 1979

Do spellings enhance memory for vocabulary words?

Fifth graders were taught pronunciations and meanings of 10 unknown concrete nouns

- **Examples of words:**
  - Barrow: a small hill
  - Tandem: a horse-drawn carriage
  - Fribble: a foolish shallow person
  - Tamarack: a big tree found all over America
  - Proboscis: a really big nose



Proboscis

Students studied words and meanings

Picture of each word shown, word pronounced and defined

- **5 words: spellings shown when words studied**
- **5 words: spellings not shown but words repeated an extra time**

Students recalled words and meanings – no spellings were shown

Picture shown – "What is this called?" – test recall of pronunciation

Word pronounced – "What does it mean?" - test recall of definition

Rosenthal & Ehri, 2008

Spellings facilitate vocabulary learning

Results: Students recalled pronunciations and definitions of the words much better when they had seen spellings of the words than when they had not.

Orthographic facilitation has been found for several types of students
from kindergarten to adulthood,

Spellings facilitate recall of words in kindergartners

FE

“fee”

MO

“mow”

BA

“bay”

JI

“jie”

LU

“lue”

O’Leary & Ehri, 2020

Spellings facilitate vocabulary learning

Orthographic facilitation has been found for several types of students

- from kindergarten to adulthood,
- for students with dyslexia, autism, and Down syndrome,
- for English language learners, and bilingual students,
- for hearing impaired children

Exceptions

- Readers of braille, Chinese characters

Exposure to spellings

- Learning incidental - no attention drawn to spellings – automatic activation of connections
- Learning enhanced when spellings are decoded

Impact of Spellings on Speech

Orthographic skeleton hypothesis – Anne Castle's lab

Mispronunciations of words by people with poor literacy skill

Segmenting phonemes in spoken words

- PITCH segmented into p-i-t-ch versus RICH segmented into r-i-ch

Speed to judge rhyming words - influenced by spellings

- Do pairs of spoken words rhyme?
  - Yes: GLUE – CLUE judged quicker than GLUE - SHOE
  - No: BOMB – SOAP judged quicker than BOMB - COMB

Spellings are not shown in these tasks so influence comes from memory

Sight Word Reading

Does orthographic mapping underlie sight word reading?

Skills needed at the Full Phase:

- Grapheme-phoneme relations
- Decode unfamiliar words
- Orthographic mapping:
  - Bond spellings to pronunciations to store words in memory for sight word reading

Grapheme-phoneme connections are more completely formed in the full phase than in the partial phase.

Movement into the Full Phase

Teaching Grapheme-Phoneme Mapping for Sight Word Reading

- **Study with 1st graders in the partial phase**
  - Knew letter names but not sounds
  - Could not decode novel words
- **Portuguese spoken words**
  - Syllables are salient
  - Spelled consistently in written words
  - Examples: escola – 3 syllables; alfabeto – 4 syllables
- **Traditional beginning reading instruction**
  - Read whole syllables
    - Examples: SA SE SI SO SU; MA ME MI MO MU

Teaching Grapheme-Phoneme Mapping

- Three treatments compared:
  1. Decode syllables with grapheme-phoneme units
  2. Read whole syllables
  3. No decoding; practice single grapheme-phoneme relations
- Training Sets
- Set 1: SA, SE, SI, SU, ME, MI, MO, MU
  Set 2: FA, FE, FO, FU, ZE, ZI, ZO, ZU
  Set 3: VA, VI, VO, VU, LA, LI, LO, LU
  Set 4: BA, BE, BI, BO, TA, TE, TO, TU
  Set 5: DA, DE, DI, DU, PA, PE, PI, PO
- Review Set
- BA, BI, DE, DU, FA, FU, LI, LO, ME, MU,
  PA, PO, SE, SU, TA, TU, VI, VO, ZE, ZI

Training continued until each child could read all syllables perfectly

Results

- **Grapheme-phoneme group** far outperformed syllable and letter-sound group**s**
  - During training: they learned to read syllables much faster
  - After training: sight word learning task
  - **They learned to read 12 multisyllabic words from memory much better**

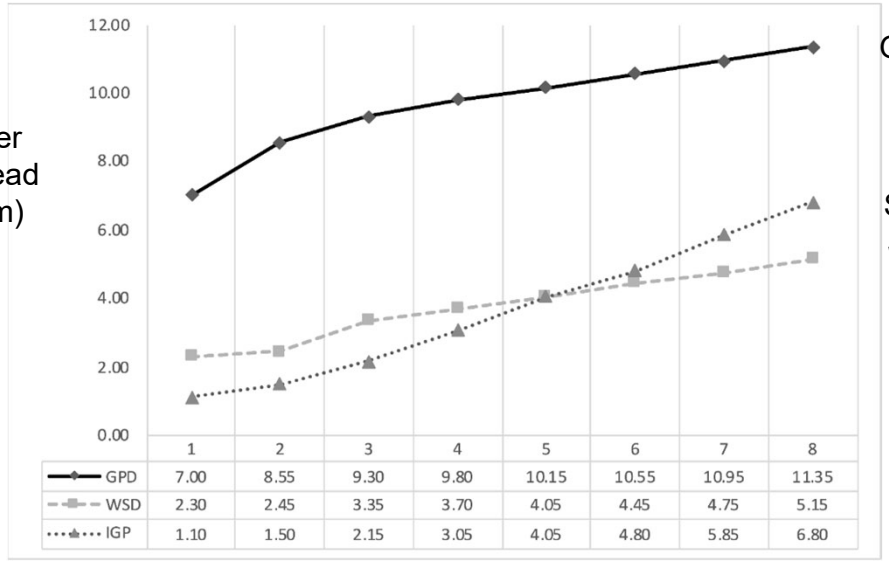
Examples of sight words:

LOTADU (crowded)

PALITU (toothpick)

SUBIDA (to climb)

Sight Word Learning Over Trials



	1	2	3	4	5	6	7	8
GPD	7.00	8.55	9.30	9.80	10.15	10.55	10.95	11.35
WSD	2.30	2.45	3.35	3.70	4.05	4.45	4.75	5.15
IGP	1.10	1.50	2.15	3.05	4.05	4.80	5.85	6.80

Sargiani, Ehri & Maluf, 2022

Results

Other posttests: Grapheme-phoneme group outperformed other two groups

- Grapheme-phoneme relations
- Phonemic awareness
- Spelling words

Surprising findings: Whole syllable group

- Did not learn grapheme-phoneme relations
- 95% scored zero when asked to say the sounds of graphemes
- 85% could not segment any words into phonemes

- Despite knowing all the letter names that contained phonemes
- Despite extensive practice reading syllables till perfect

Movement from partial to full alphabetic phase

Requires learning to decode words using grapheme-phoneme units

Contribution of systematic phonics instruction

Dr. Renan Sargiani

Assistant Professor, Universidade Cruzeiro do Sul, Brazil

Served in Ministry of Education

Chaired Brazillian National Reading Panel

Wrote beginning reading curriculum

Talks to teachers to explain how instruction

- based on Ehri's alphabetic phase theory
- is more effective than Emilia Ferreiro's constructivist stage theory

Instagram Post

Reading Words by Analogy vs. Grapheme-Phonemes

Keyword method: read words by analogy to keywords

Subunits = onset rimes: use -ump in jump to read “bump”

3-4 keywords taught each week over 28 weeks, 120 total

Examples: and, in, up, king, long, jump, let, pig, day, truck, black, not, cat, it, go, look, red, fun, he, name, swim, my, map, car, vine, see, can, tent, round, skate, ten, old, frog, right, slide, stop, tell, her, an, smash

Word reading strategy: use keywords to read new words

Problems observed in students:

Could segment words into onsets and rimes but not phonemes

Difficulty storing keywords in memory

Reading words using partial letters and context cues

Irene Gaskins,
Founder and Director
Of Benchmark School

Revised Program: Word Detectives

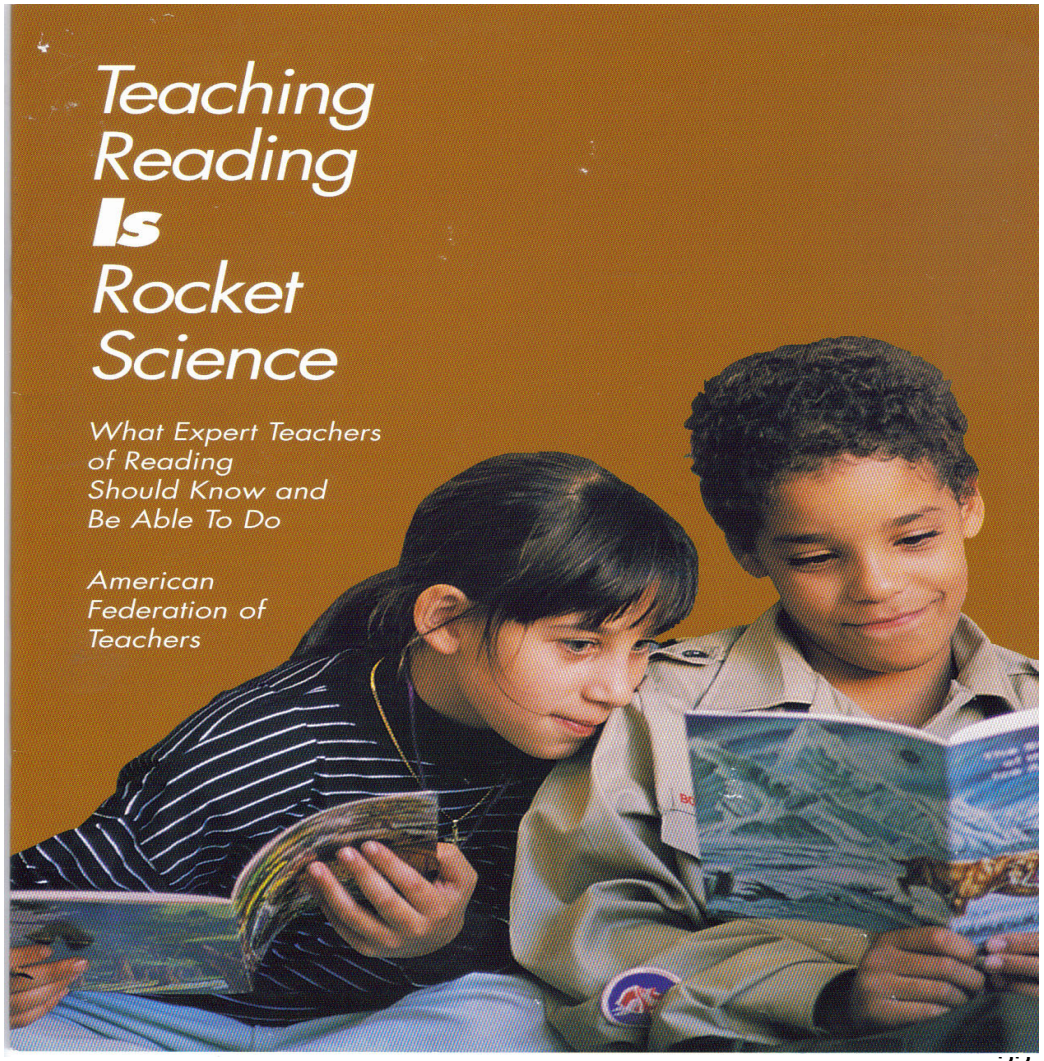
Example of a daily routine to teach 3-4 keywords each week.

Purpose: fully analyze keywords into grapheme-phonemes to store spelling in memory

1. Each keyword is spoken.
2. Word is segmented into phonemes as finger is lifted for each phoneme
3. Word's spelling is shown and graphemes are matched to phonemes
4. Word is written by saying each phoneme and writing its grapheme
5. All 3-4 keywords are spelled from memory.
6. Keywords are used to read unfamiliar words.

Results of study: students receiving Word Detective instruction read and spelled more words than student receiving Keyword instruction.

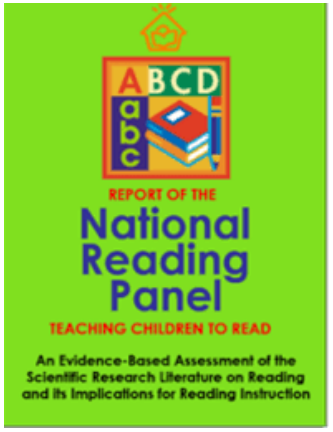
Gaskins, Ehri, Cress, O'Hara, & Donnelly, 1996
Ehri, Satlow & Gaskins, 2009



Written By Louisa Moats

"As a physicist chairing this panel for two years and preparing this report, I have come to realize that teaching reading is really much *harder* than rocket science!"

Dr. Donald Langenberg, Chair of the National Reading Panel, 2000



LEhri@gc.cuny.edu