Critical Factors in Polysyllabic Word Reading: Roles of Letters, Sounds, and Meanings

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Overview

• What are polysyllabic words and why do they matter?
• What about polysyllabic words makes them hard to read?
• What makes some children struggle with these words?
• What strategies are frequently taught?
  – What does evidence suggest?
  – What do we recommend you do?
What are polysyllabic words and why do they matter?
Definition of “polysyllabic words”

Contain more than one syllable

Syllables are defined by *sounds*, not letters

Syllables always have a peak, usually a vowel

Clements & Keyser (1983)
Polysyllabic words become more common in texts in the upper grades

Renaissance Learning, 2012; Zeno, Iven, Millard, & Duvvuri, 1995
Polysyllabic words occur in a lot of content area texts

Bryant, Ugel, Thompson, & Hamff, 1999
What makes polysyllabic words hard to read?
Vowel letters make multiple sounds

- minor /aɪ/
- hi /aɪ/
- hit /ɪ/
- raisin /i/
Syllable division is complex

in _minor _linen

ea _weather _reality

st _master _estate

VCV

VVV

VCCVV

Wilson Reading System (Wilson, 2005)

Treiman, Bowey, & Bourassa, 2002; Treiman, Mullennix, Bijeljac-Babic, & Richmond-Welty, 1995; Treiman & Zukowski, 1990; Taft, 1979; Taft, 1992
Stress assignment is hard

mirripe
/ˈməɹ aɪp/
/məɹ ˈraɪp/

Rastle & Coltheart (2000)
Children experiencing difficulty with stress assignment.
Polysyllabic words are often polymorphemic

Morphological status of English words (Nagy & Anderson, 1984)
7% morphologically basic
12% affixed
17% compounds/contractions
16% inflected

Nagy & Anderson (1984); Frost (2012)
What makes some children struggle with these words?
They have weak phonological awareness skills

Rhyming

/wɔk/ walk

/tɔk/ talk

/chɔk/ chalk
Segmenting & Blending

/rakɪt/
/r-a-k-ɪ-t/
/ra-kɪt/
Deletion (Elision)

Say *pretend* without saying *pre*

Say *replayed* without saying */d/**/
They have poor grapheme-phoneme correspondence (GPC) knowledge

\[ s = /s/ \]

\[ tion = /ʃən/ \]

Kearns (2013)
They are unable to utilize bigger chunks in words.

Gillbert, Goodwin, Compton, & Kearns (in press)
They have limited vocabulary

tariff

stirrup

manila

Kearns & Al Ghanem (2014)
What strategies are frequently taught? Which should be taught?
Here’s a classroom example of some polysyllabic word reading instruction

• This is Devin teaching a group of struggling 6th graders to read polysyllabic words

• Notice the strategies being used
What did we see in the video?

- Instruction on syllable types
- Phonics blending by syllable
- Breaking words into chunks
What other strategies are taught in commonly used programs?

- Emphasizing morphemes
- Teaching flexibility
- Teaching syllable division rules
- Teaching phonological awareness for syllables

PHAST/Empower Reading
Wilson Reading System
Lindamood-Bell Phoneme Sequencing Program
REWARDS
Words by Marcia Henry
Project READ
Common strategies taught for reading polysyllabic words

- Instruction on syllable types
- Phonics blending by syllable
- Breaking words into chunks
- Emphasizing morphemes
- Teaching flexibility
- Teaching syllable division rules
- Teaching phonological awareness for syllables
Does evidence support these strategies?
Important note

• We are not endorsing a particular program
• We are sharing these strategies for two reasons:
  1. To help evaluate a program to see if it includes good polysyllabic word reading techniques
  2. To help decide if/how you should supplement a program
1. Syllable Types

- Some studies included syllable type instruction and had positive effects
  - Cohen & Brady (2011)
  - Diliberto, Beattie, Flowers, & Algozzine (2009)
  - Shefelbine (1990)
- Other studies have NOT taught syllable types and achieved good effects
  - Lovett, Lacerenza, De Palma, & Frijters (2012)
  - Morris et al. (2012)
  - Shippen, Houchins, Steventon, & Sartor (2005)
  - Vadasy, Sanders, & Peyton (2006)
Our recommendation: *Maybe* teach *important* syllable types

- **Open Syllable**
  - The vowel comes at the end of the syllable.
  - The vowel says its "long" sound.

- **Closed Syllable**
  - The vowel comes at the beginning or in the middle of the syllable.
  - The vowel says its "short" sound.

- **Consonant-le Syllable**
  - The syllable has only three letters (consonant + l + e)
  - Occurs at only at the end of the word
  - The e is silent
But, this probably is *not* a good idea:
Too “cognitive”
2. Phonics blending by syllable

- Our data indicate that when given polysyllabic, polymorphemic words, readers tend to use morphological units

Kearns (2013)
• We also have data showing that children may rely on grapheme-phoneme correspondences (GPCs) units in the absence of morphological units
• They may also try to identify words within the target word

Kearns (2013); Kearns, Cruz, Johnson, Sethi, & Xu (2014)
Most studies we have reviewed include attention to parts of the word besides GPCs

- Syllables
- Affixes
- Roots

**Peeling off tree**

“I peel off (affix) at the beginning (or end) of the word. The root is ____.
The word is ____” (p. 468)

**Ending grid**

**Overt strategy for decoding**

1. Circle the prefixes.
2. Circle the suffixes.
3. Underline the vowels.
4. Say the parts of the word.
5. Say the whole word.
6. Make it a real word.

Our recommendations:

• Teach *chunking*
• Teach children *to look for morphemes*
3. Chunking

• Some studies suggest that chunking improves reading
  – Bhattacharya & Ehri (2007)
  – Shippens et al. (2005)
  – Wise (1992)

• Our studies show the value, as already described
Practice reading high frequency syllables
Chunking rules

1. Every syllable has a vowel letter in it

    describe

2. Each part has to look OK

    describe
4. Teach morphology

• Some studies suggest teaching morphology helps readers:
  – Henry (1989)
  – Kennedy & Backman (1993)
  – Lovett et al. (2000, 2008)
  – Morris et al. (2012)
  – Shippens et al. (2005)
  – Vadasy, Sanders, & Peyton (2006)

• Our studies suggest that readers pay attention to morphemes, especially when they are obvious
**Most Common Prefixes**

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Meaning</th>
<th>Key Word</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>anti-</strong></td>
<td>against</td>
<td>anti-</td>
</tr>
<tr>
<td><strong>dis-</strong></td>
<td>opposite</td>
<td>distinct</td>
</tr>
<tr>
<td><strong>dis-</strong></td>
<td>not, opposite of</td>
<td>disagree</td>
</tr>
<tr>
<td><strong>em-, en-</strong></td>
<td>cause to</td>
<td>encode, embrace</td>
</tr>
<tr>
<td><strong>fore-</strong></td>
<td>before</td>
<td>forecast</td>
</tr>
<tr>
<td><strong>in-, intro-</strong></td>
<td>in</td>
<td>infield</td>
</tr>
<tr>
<td><strong>in-, in-</strong></td>
<td>not</td>
<td>injustice, impossible</td>
</tr>
<tr>
<td><strong>inter-</strong></td>
<td>between</td>
<td>intersect</td>
</tr>
<tr>
<td><strong>mid-</strong></td>
<td>middle</td>
<td>midway</td>
</tr>
<tr>
<td><strong>mis-</strong></td>
<td>wrongly</td>
<td>mistake</td>
</tr>
<tr>
<td><strong>non-</strong></td>
<td>not</td>
<td>nonsense</td>
</tr>
<tr>
<td><strong>over-</strong></td>
<td>over</td>
<td>overlook</td>
</tr>
<tr>
<td><strong>pre-</strong></td>
<td>before</td>
<td>prefix</td>
</tr>
<tr>
<td><strong>re-</strong></td>
<td>again</td>
<td>return</td>
</tr>
<tr>
<td><strong>semi-</strong></td>
<td>half</td>
<td>semicircle</td>
</tr>
<tr>
<td><strong>sub-</strong></td>
<td>under</td>
<td>submarine</td>
</tr>
<tr>
<td><strong>super-</strong></td>
<td>above</td>
<td>superstar</td>
</tr>
<tr>
<td><strong>trans-</strong></td>
<td>across</td>
<td>transport</td>
</tr>
<tr>
<td><strong>un-</strong></td>
<td>not</td>
<td>unfriendly</td>
</tr>
<tr>
<td><strong>under-</strong></td>
<td>under</td>
<td>undertake</td>
</tr>
</tbody>
</table>

*Most frequent. The four most frequent prefixes account for 97 percent of prefixed words in printed school English.

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**Most Common Suffixes**

<table>
<thead>
<tr>
<th>Suffix</th>
<th>Meaning</th>
<th>Key Word</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>-able, -ible</strong></td>
<td>can be done</td>
<td>comfortable</td>
</tr>
<tr>
<td><strong>-al, -ial</strong></td>
<td>having characteristics of</td>
<td>personal</td>
</tr>
<tr>
<td><strong>-ed, -ing</strong></td>
<td>past tense verbs</td>
<td>hopped</td>
</tr>
<tr>
<td><strong>-en</strong></td>
<td>made of</td>
<td>wooden</td>
</tr>
<tr>
<td><strong>-er</strong></td>
<td>comparative</td>
<td>higher</td>
</tr>
<tr>
<td><strong>-es, -er</strong></td>
<td>one who</td>
<td>worker, actor</td>
</tr>
<tr>
<td><strong>-est</strong></td>
<td>comparative</td>
<td>biggest</td>
</tr>
<tr>
<td><strong>-ful</strong></td>
<td>full of</td>
<td>colourful</td>
</tr>
<tr>
<td><strong>-ic</strong></td>
<td>having characteristics of</td>
<td>linguistic</td>
</tr>
<tr>
<td><strong>-ing</strong></td>
<td>verb form or present participle</td>
<td>running</td>
</tr>
<tr>
<td><strong>-en, -ien, -ation, -ion</strong></td>
<td>act, process</td>
<td>occasion, attraction</td>
</tr>
<tr>
<td><strong>-ry, -ty</strong></td>
<td>state of</td>
<td>infinity</td>
</tr>
<tr>
<td><strong>-ive, -ative, -tive</strong></td>
<td>adjective form of a noun</td>
<td>plausible</td>
</tr>
<tr>
<td><strong>-less</strong></td>
<td>without</td>
<td>fearless</td>
</tr>
<tr>
<td><strong>-ly</strong></td>
<td>characteristic of</td>
<td>quickly</td>
</tr>
<tr>
<td><strong>-ment</strong></td>
<td>action or process</td>
<td>enjoyment</td>
</tr>
<tr>
<td><strong>-ness</strong></td>
<td>state of, condition of</td>
<td>kindness</td>
</tr>
<tr>
<td><strong>-ous, -eous, -ious</strong></td>
<td>possessing the qualities of</td>
<td>joyous</td>
</tr>
<tr>
<td><strong>-s, -es</strong></td>
<td>more than one</td>
<td>books, boxes</td>
</tr>
<tr>
<td><strong>-y</strong></td>
<td>characterized by</td>
<td>happy</td>
</tr>
</tbody>
</table>

*Most frequent. The four most frequent suffixes account for 97 percent of suffixed words in printed school English.

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Practice with flash cards
Teach *morphological* word families

Wolf et al. (2009)
## Word family for *nature*

<table>
<thead>
<tr>
<th>Supernaturally</th>
<th>Supernaturalism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preternaturally</td>
<td>Naturalism</td>
</tr>
<tr>
<td>Naturalists</td>
<td>Naturalist</td>
</tr>
<tr>
<td>Naturalizes</td>
<td>Naturalistic</td>
</tr>
<tr>
<td>Naturalistically</td>
<td>Naturalization</td>
</tr>
<tr>
<td>Naturalizing</td>
<td>Naturally</td>
</tr>
<tr>
<td>Unnatural</td>
<td>Naturalness</td>
</tr>
<tr>
<td>Supernatural</td>
<td>Natures</td>
</tr>
<tr>
<td>Supernaturalism</td>
<td>Nature's</td>
</tr>
<tr>
<td>Preternatural</td>
<td>Denatured</td>
</tr>
</tbody>
</table>

### Teach words families in groups
- Teach a variety of these words
- Teach words that are likely known
- Teach words that are likely known
## Importance of words children know

### Table 1.
Different Polysyllabic Word Reading Programs and the Words Used

<table>
<thead>
<tr>
<th>Program</th>
<th>Activity</th>
<th>Number of words</th>
<th>Freq</th>
<th>Target grade</th>
<th>Grade Freq</th>
<th>Letters</th>
<th>Sounds</th>
<th>Sylls</th>
<th>Morphemes</th>
<th>Patterns for Success in Reading and Spelling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patterns for Success in Reading and Spelling</td>
<td>Divide words using vc/vc rule and read words</td>
<td>32</td>
<td>47.92</td>
<td>5</td>
<td>29.28 (51.54)</td>
<td>6.03</td>
<td>0.40</td>
<td>5.06</td>
<td>0.80</td>
<td></td>
</tr>
<tr>
<td>REWARDS</td>
<td>Underlining vowels</td>
<td>15</td>
<td>45.58</td>
<td>5</td>
<td>6.90 (6.01)</td>
<td>6.57</td>
<td>1.09</td>
<td>5.43</td>
<td>0.76</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Circling prefixes and suffixes</td>
<td>21</td>
<td>42.59</td>
<td>5</td>
<td>6.60 (6.28)</td>
<td>6.42</td>
<td>1.50</td>
<td>5.95</td>
<td>1.68</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Multistep strategy instruction and practice</td>
<td>18</td>
<td>46.79</td>
<td>5</td>
<td>11.43 (21.77)</td>
<td>9.39</td>
<td>1.29</td>
<td>8.00</td>
<td>1.03</td>
<td></td>
</tr>
<tr>
<td>Wilson Reading System</td>
<td>Combining closed syllables into multisyllabic words</td>
<td>10</td>
<td>50.99</td>
<td>3</td>
<td>24.56 (23.46)</td>
<td>5.60</td>
<td>0.52</td>
<td>5.60</td>
<td>0.52</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Combining closed syllables into multisyllabic words</td>
<td>20</td>
<td>42.86</td>
<td>5</td>
<td>8.92 (10.46)</td>
<td>5.85</td>
<td>0.49</td>
<td>5.30</td>
<td>0.57</td>
<td></td>
</tr>
<tr>
<td>Words Their Way with Struggling Readers</td>
<td>Sort words by type</td>
<td>16</td>
<td>54.55</td>
<td>5</td>
<td>59.56 (63.80)</td>
<td>5.44</td>
<td>0.73</td>
<td>4.81</td>
<td>0.91</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.00 (0.00)</td>
<td>2.00</td>
<td>0.00</td>
<td>1.25</td>
<td>0.45</td>
<td></td>
</tr>
</tbody>
</table>

Note: REWARDS = Reading Excellence: Word Attack & Rate Development Strategies

- Use words that students likely have **heard** before.
- Uncommon words are ok, obscure word are not.

If you use less common words, introduce them ahead of time so students have some exposure.
Evidence for using vocabulary children know

• In multiple studies, we have seen that children’s vocabulary knowledge related strongly to their polysyllabic word reading ability
  – Kearns (2013)
  – Kearns, Steacy, Compton, Gilbert, and Goodwin (in preparation)
  – Goodwin, Gilbert, Cho, & Kearns (2014)
How much emphasis on meaning?

trans = across
transport = carry across?
port = carry

Focus on root *words*, not roots that cannot stand alone, and use words that are in children’s vocabularies.
Focus on the root?

<table>
<thead>
<tr>
<th>Word</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>interrupt</td>
<td>Maybe ... “rupt” will not help with meaning very much, but it’s a useful syllable</td>
</tr>
<tr>
<td>repair</td>
<td>Probably ... “pair” is very common, but it does not link to the word “repair” very well</td>
</tr>
<tr>
<td>explanation</td>
<td>Yes ... “explain” has a sizeable word family and the change needs practice</td>
</tr>
<tr>
<td>scientist</td>
<td>Yes ... “science” also has a sizeable word family and the change also needs practice</td>
</tr>
<tr>
<td>visualize</td>
<td>Probably not ... “vis” is a simple syllable, and it only helps a little with meanings (but it does help)</td>
</tr>
</tbody>
</table>
5. Emphasize flexibility

• Multiple studies have shown that a flexible strategy results in achievement gains
  – Bhattacharya & Ehri (2004)
  – Lovett et al. (2000, 2008)
  – Morris et al. (2012)
  – Shippen et al. (2005)

• We have shown that children’s ability to recognize nonwords is linked to their ability to determine what word we were “trying to say”
What are these words?

breek-fast  moth-er

kit  /kɪt/  /kʰɪt/  

kitten

ten  /tɛn/  /n/
So... emphasize flexibility

- “Turn the word like the radio dial to make it come in better”
- “Tune it like a guitar: Change the pronunciation to make it sound better.”

Watch Ms. Ish do this
Another way to emphasize flexibility

“First, I will try /first pronunciation/, then I will try /second pronunciation/, and see which gives me a real word” (Lovett et al., 2000, p. 469)
6. Teach syllable division

• Only one study showed a positive effect for a program including syllable division
  – Diliberto et al. (2009)

• Another study did not show an effect
  – Canney & Schreiner (1976)

• We have not studied this directly
In theory, why might teaching syllable division be a bad idea?

• Word reading should be very fast
• If you think about dividing words into syllables, it will slow you down
• The process is artificial and unlike real reading
Our recommendation

- Do not teach strict syllable division
- Use a more flexible strategy instead

**Overt Strategy**
1. Circle the prefixes.
2. Circle the suffixes.
3. Underline the vowels.
4. Say the parts of the word.
5. Say the whole word.
6. Make it a real word.

**EXAMPLE**
reconstruction

**Covert Strategy**
1. Look for prefixes, suffixes, and vowels.
2. Say the parts of the word.
3. Say the whole word.
4. Make it a real word.

Archer, Gleason, & Vachon (2003)
7. Phonological awareness at the syllable level

• Only one study explicitly included this practice
  – Kennedy & Backman (1993)
• We did not find strong phonological effects for polysyllabic word reading

T: That says gaptional; show me gaptural.
S: Add a –ture. (Add felt before –al.)
Our recommendation

• Phonological awareness might be helpful for placing stress
• At this level, it makes sense to link sounds to letters
• Practice manipulating chains of words, but let students see the written words
But this is a terrible word for actual instruction.
Additional recommendations
1. Make sure foundational skills are solidly in place already

- Large sight word vocabulary
  - Fast, completely accurate retrieval for top 500 sight words
  - Expanding store of other words children know

- Letter-sound knowledge including GPCs, digraphs, r-controlled vowels, and phonograms
  - Accurate pronunciation of sounds (esp. short vowels)

- Decoding skill for monosyllabic words with up to six sounds (e.g., *script*, *cramps*)
  - Quick, accurate decoding without reliance on guessing, context, reading on, or using pictures
2. Draw students’ attention to stress patterns

• Do not teach rules for stress; they are too complicated

• Link to real words (again, use words they know)
Thank you very much!

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