Learning about writing

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Alphabetic writing systems
Represent spoken language at the level of individual sounds or phonemes

Examples
- English
- Portuguese

Alphabetic systems are highly efficient, once learned
Can construct a plausible spelling of a word, even if word has not been seen before
Don’t have to rely on rote memorization of words’ spellings
Alphabetic writing systems can be hard to learn

Phonemes are abstract
- Children’s difficulties analyzing spoken words into phonemes

Links between phonemes and letters may be complex
- Some phonemes have more than one possible spelling
- Some phonemes are spelled with sequences of two letters

Topic for today: Learning to spell in alphabetic writing systems

Phonological perspective

Constructivist perspective

Statistical-learning perspective

Phonological perspective

Importance of alphabetic knowledge

Phase theory is one influential theory within this general perspective

Children move through phases of development during which they show an increasing ability to map the sounds of words onto phonologically appropriate letters

Prealphabetic phase

Children’s spellings are random strings of letters that have no relationship to the sounds in words

Example: hs for “quick”
Partial alphabetic phase

Children represent a few sounds in words with phonologically appropriate letters

Do not represent all sounds

*Ivented* spelling

Partial alphabetic spellings

Certain sounds are likely to be omitted

- Nasal sounds like “m” are often omitted when before other consonants
- Nasal sounds are less likely to be omitted in other positions
- Difficulties with analysis of spoken words into phonemes
Partial alphabetic spellings

Letter name effects

A sequence of sounds that is the name of a consonant letter may be spelled with that letter alone
- *cr* for *car*
- *R U DF*?

A vowel sound may be spelled with the letter that has that name
- *R U DF*?
- *gat* for *gate*
- *iea* for Portuguese *bicicleta*

Full alphabetic phase

All phonemes are represented with phonologically plausible letters
- Spelling may be correct, as in *car*
- Spelling may be incorrect (invented) but phonologically plausible, as in *kar, ckar, or jumpt*

Choose spellings purely on the basis of sound

Consolidated alphabetic phase

Children begin to consider factors other than phonology when choosing spellings
- Avoid *ckar* because know that *ck* doesn’t occur at the beginnings of words
- Graphotactic knowledge

Avoid *jumpt* because know that past tense ending should be spelled as *ed* even when it sounds like *t*
- Morphological knowledge (related to units of meaning)

Importance of phonological perspective

Children construct spellings; they do not just memorize whole words
- Both experimental and naturalistic data
- Studies of English and of other languages, including Portuguese

Educational implications: importance of teaching children about links between sounds and letters (phonics)
Limitations of phonological perspective

Little attention to nonphonological aspects of spelling

Some aspects of spelling, even in alphabetic writing systems, don’t represent phonology
Mark (name) vs. mark (word)
ed for English past tense ending, regardless of its pronunciation

Are prealphabetic spellings really random sequences of letters?

Pollo, Kessler, and Treiman (2009)

Studied U.S. and Brazilian 4-year-olds

Focused on prealphabetic or “random letter” spellers

A U.S. prealphabetic speller

<table>
<thead>
<tr>
<th>gummi</th>
<th>light</th>
<th>dice</th>
<th>blow</th>
<th>pony</th>
<th>try</th>
</tr>
</thead>
</table>

Prealphabetic spellers

Tend to use letters that are common in the writing system to which they have been exposed

Tend to use two-letter sequences that are common in the writing system to which they have been exposed
Prelalphabetic spellers
Are more likely to use sequences of letters in alphabetic order than would be expected by chance

Are more likely to use letters from their own first name than would be expected on the basis of other factors

Limitations of phonological perspective
Early spellings that appear to be random sequences of letters reflect certain characteristics of the writing system to which the child has been exposed

U.S. 6-year-olds’ knowledge of nonphonological patterns (Treiman, 1993 and others)

bbef  bef
nuck  ckun

Earlier knowledge of graphotactic patterns than phase theory would suggest

More on early knowledge of graphotactic patterns: Wright and Ehri (2007)

Initial doublet:  rrug

Final doublet:  fitt

No doublet:  fan
### Wright and Ehri (2007)

<table>
<thead>
<tr>
<th>Type</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial doublet: <strong>rrug</strong></td>
<td><strong>rug</strong>, <strong>rugg</strong></td>
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<tr>
<td>Final doublet: <strong>fitt</strong></td>
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</tr>
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<td><strong>fan</strong></td>
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### Wright and Ehri (2007) results

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<tbody>
<tr>
<td>Initial doublet: <strong>rrug</strong></td>
<td><strong>rug</strong>, <strong>rugg</strong> (Transposition error)</td>
</tr>
<tr>
<td>Final doublet: <strong>fitt</strong></td>
<td><strong>fitt</strong></td>
</tr>
<tr>
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### Three perspectives on spelling development

**Phonological perspective**
- Draws attention to importance of phonology in learning to write and read in alphabetic systems
- Gives short shrift to nonphonological knowledge, including graphotactic and morphological patterns

**Constructivist perspective**

**Statistical-learning perspective**

**Phonological perspective**
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**Constructivist perspective**

**Statistical-learning perspective**
### Constructivist perspective

Ferreiro and Teberosky (1982) and others

Piaget’s stage theory of cognitive development

Ferreiro and Teberosky’s stage theory of literacy development

- Presyllabic stage
- Syllabic stage
- Alphabetic stage

### Presyllabic stage

**Minimum quantity hypothesis:** A word must have a certain minimum number of letters

- $bcde$ more likely to be a word than $bc$

**Variation hypothesis:** The letters in a word should all be different

- $abcd$ more likely to be a word than $abbc$

Children tend to avoid doubling (or tripling or ...) of letters when spelling words

### Syllabic stage

Children, even those exposed to alphabetic writing systems, hypothesize that each letter stands for a syllable

- $oa$ for $bota$ in Portuguese
- $uuu$ for $urubu$ in Portuguese
- $iae$ for $primavera$ in Italian

Analysis of words into syllables easier than analysis of words into phonemes

### Presyllabic stage

**Referential writing:** Writing should in some respects look like the object to which it refers

- Mosquito $\Rightarrow$ small object
  $\Rightarrow$ few/small letters

- Bear $\Rightarrow$ large object $\Rightarrow$
  many/large letters

### Syllabic stage

- Analysis of words into syllables easier than analysis of words into phonemes
Stages of development according to constructivist view

- Presyllabic
- Syllabic
- Alphabetic

Strength of constructivist perspective

Idea that young children in literate societies know a good deal about writing before they understand that it represents language at the level of phonemes, even before they understand that it represents language at all.

Testing some specific constructivist ideas

Minimum quantity hypothesis

Do children believe that words should contain a minimum number of letters?

Pollo et al. (2009): Brazilian and U.S. nonphonological spellers produce a number of 1- and 2-letter spellings

Variation hypothesis

Pollo et al. (2009): Nonphonological spellers tend to avoid double letters
Consistent with constructivist view

Nonphonological spellers in Brazil avoid double letters more than do nonphonological spellers in U.S.
Not consistent with constructivist view
Portuguese has less doubling than English *comitê* vs. *committee*
Referential writing

Do children use more letters or bigger letters when writing words for large objects than when writing words for small objects?

Pollo, Treiman, Kessler, and Rosenzweig (submitted):
- No differences as a function of object size when writing, across two different experiments
- Differences as a function of object size when drawing

Syllabic hypothesis

Many of the spellings that appear to support the idea of a syllabic stage actually reflect children’s use of letter names to spell vowels
- "oa" for Portuguese "bota"
- "uuu" for Portuguese "urubu"

Little evidence for a syllabic stage in studies by Pollo, Cardoso-Martins, and colleagues
Limitations of constructivist perspective

Support has tended to come from studies that lack rigor

Overreliance on anecdotal evidence

More rigorous studies fail to support certain central ideas of constructivist theories

- Minimum quantity hypothesis
- Preference for within-word variation that is independent of the input
- Referential writing
- Syllabic spellings

Questions about whether instruction should be based on constructivist principles

Phonological perspective

- Draws attention to importance of phonology in learning to write and read in alphabetic systems
- But gives short shrift to nonphonological knowledge

Constructivist perspective

- Draws attention to the fact that children know a good deal about writing from an early age
- But little support for the idea that children form hypotheses that go far beyond the written input to which they are exposed

Statistical-learning perspective

Statistics: Sensitivity to frequencies or patterns

In U.S. and Brazil, a and e are commonly seen in books, on signs, and so on; j and z and Ø are less common

Sequences like ccc are rare
Statistical-learning perspective

Agrees with phonological perspective that phonology is important

More emphasis on nonphonological aspects of spelling

Children learn about some nonphonological patterns quite early, by observing statistics of writing around them

Statistical-learning perspective

Agrees with constructivist perspective that young children in literate societies know some things about writing before they know that it represents phonemes

Emphasizes that children’s writing reflects the characteristics of the input to which they have been exposed

Even young children are affected by the statistics of the writing to which they are exposed

Use of letters and letter pairs (Pollo et al., 2005; 2009)

- Nonphonological spellers tend to use letters and letter pairs that are common in their writing system
- Different patterns of letter use in children exposed to English and Portuguese
- Input: Children who are exposed to different languages see different patterns of letter use

Even young children are affected by the statistics of the writing to which they are exposed

Letter doubling (Pollo et al., 2009)

- Nonphonological spellers who are exposed to English use more double letters than those who are exposed to Portuguese
- Input: English has more doubling than Portuguese
Even young children are affected by the statistics of the writing to which they are exposed

Alphabet sequence (Pollo et al., 2009)
Children use alphabetic sequences more often in spelling words than expected on the basis of chance
Input: Children in many societies often see and hear the alphabet in order

Own names (Pollo et al., 2009; Treiman, Kessler, & Bourassa, 2001; and others)
Young children tend to overuse letters from their own name when spelling other words
Input: Some aspects of print exposure are individual to the child; young children often see their own names and pay special attention to them

Continuity across development
Ferreiro and Teberosky’s constructivist theory: qualitatively different stages of development
Phase theory: different types of knowledge and skills predominate at each phase
Statistical-learning view: same basic mechanisms underlie learning of spelling (and other things) throughout development

Statistical learning in later development of spelling
In many alphabetic writing systems, some phonemes have more than one possible spelling
Often, one alternative is most frequent in certain contexts and another alternative is most frequent in other contexts
vowel sound of put and book
oo spelling is common before k
Statistical learning in later development of spelling

By learning about the statistics, children can improve their chances of spelling the sound correctly.

Context conditioning

Reduces need for rote memorization

Implicit and explicit learning

Statistical learning is often implicit

Can be slow and incomplete

Explicit instruction is helpful

Summary: Three perspectives on spelling development

Phonological perspective

Constructivist perspective

Statistical-learning perspective

Pedagogical implications

Phonological perspective

Teaching of phonics

Constructivist perspective

Self discovery

Statistical-learning perspective

Opportunities for statistical learning

Explicit instruction