



Linguistic Factors in Spelling Development

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Introduction

Views of spelling development in English have been influenced by our notions about the nature of the writing system and by prevailing theories of learning. Until the 1960s, the English writing system was seen as complex and illogical. This led to the idea that spelling is a form of rote memorization or serial learning, types of learning that were widely studied at the time. As language researchers began to point to previously unacknowledged regularities in the relations between spoken and printed English (e.g., Chomsky & Halle, 1968; Venezky, 1970), and as cognitive psychologists began to see people as active learners, views of spelling development changed. It became apparent that children have the ability to actively search for structure in written language. Spelling was increasingly seen a creative process of symbolizing the linguistic structure of words, not just a learned habit. Modern research on spelling development has focused on children's acquisition of three important types of linguistic knowledge: phonological, orthographic, and morphological.

Key Research Questions

1. What types of linguistic knowledge are critical for successful spelling development?
2. Are some types of linguistic knowledge more easily mastered than others?
3. How can our understanding of children's spelling patterns inform instructional approaches?

Recent Research Results

Phonological Knowledge

For most children, spelling does not emerge all at once in kindergarten or first grade. Typically, a long period of development precedes the first independently produced, readable spellings. Preschoolers may attempt to write by making marks with a crayon or pencil even before they know the letters of the alphabet. Although children as young as 3 or 4 years distinguish writing from drawing (Lavine, 1977), they have yet to

understand that the function of alphabetic writing is to represent the sounds of language. Instead, some young children seem to believe that the written forms of words should reflect their meanings. For example, they may think that the names of large objects, such as *bear*, should be spelled with more letters than the names of small objects, such as *mosquito* (Ferreiro & Teberosky, 1982; Levin & Korat, 1993; Levin & Tolchinsky-Landsmann, 1989).

Once children understand that print represents speech, they still have to master the specifics of the speech-to-print translation process. This can be difficult when children's analyses of spoken words do not reach the level of individual phonemes or speech sounds. Children may spell groups of phonemes with single letters, symbolizing speech at a level that is larger than the individual phoneme but smaller than the syllable. One example of this grouping phenomenon involves consonant clusters at the ends of words. Children sometimes fail to spell the initial consonants of these clusters, writing "had" for hand and "grak" for drink (Read, 1975; Snowling, 1994; Treiman, 1993; Treiman Zukowski, & Richmond-Welty, 1995). Children may consider the spoken form of hand to contain three units of sound—initial /h/ followed by /æn/ followed by /d/. For them, the vowel and the following /n/ form a single unit rather than a sequence of two units. Children may use one letter to symbolize this unit, spelling the word as "had" even while pronouncing it correctly. Failure to represent the initial consonant of a final consonant cluster is especially common for nasal and liquid consonants, which include /n/, /m/, /r/, and /l/.

With initial clusters, too, children sometimes group together separate phonemes. Young children sometimes fail to spell the second consonants (and third consonants, if present) of these clusters, as in "pa" for *play* and "set" for *street* (Bruck & Treiman, 1990; Treiman, 1985, 1991, 1993). Children's omissions of consonants in initial clusters, like their omissions of consonants in final clusters, may reflect their groupings of sounds. Children may consider the spoken word *play* to contain the initial consonant unit /pl/ followed by a vowel. They may symbolize the cluster with a single letter rather than analyzing it into two phonemes and symbolizing each phoneme with a separate letter.

A final example of children's tendency to use units larger than single phonemes in relating print and speech is their use of a letter to represent all of the phonemes in the letter's name. Examples include "cr" for *car* and "bl" for *bell*. The *r* in the former spelling apparently stands for both the vowel and the /r/, which together constitute the name of the letter *r*. In the error "bl," the letter *l* represents both the vowel and the /l/ sound, which together make up *l*'s name. Several researchers have observed such letter-name spellings among young children (Ehri, 1986; Gentry, 1982; Read, 1975; Treiman, 1993, 1994). Among consonants, the errors are most common for *r* and next most common for *l* (Treiman, 1993, 1994). These are the two English consonants whose names consist of vowel-liquid sequences, which are difficult to segment.

Although some of young children's errors reflect segmentation problems, others reflect a tendency to represent aspects of words' sounds that are not obvious to adults. For

example, children sometimes spell /d/ before /r/ as *g* or *j*, as in the aforementioned “grak” for *drink* (Read, 1975; Treiman, 1993). This makes sense given that /d/ in this context is pronounced similarly to the initial sound of *Jim*, which is typically spelled as *j* (*Jim*) or *g* (*gym*). These and other errors suggest that children’s classifications of sounds do not always match those assumed by the conventional writing system.

Orthographic Knowledge

The ability to identify all of the phonemes in a spoken word does not guarantee that the word will be spelled correctly. When selecting the letters to represent the phonological structure of words, children are faced with many choices. Some phonemes have more than one possible spelling, and the correct choice sometimes depends on the position of the phoneme in the word. For example, *ck* may occur in the middles and at the ends of English words, as in *packet* and *pack*. This two-letter sequence, or *digraph*, does not occur at the beginnings of words. Other so-called *orthographic* patterns involve *doublets*, or two-letter spellings in which the two letters are identical. Certain letters may occur as doublets, such as *l*. Other letters, such as *v* and *h*, rarely or never double. Consonant doublets typically occur in the middles and at the ends of words, as in *supper* and *inn*; they rarely occur at the beginnings. Treiman (1993) and Cassar and Treiman (1997) found that children begin to learn about these patterns from an early age. Even kindergartners had some knowledge about the allowable position of consonant doublets, and knowledge of which consonants are allowed to double emerged in first grade. Typically, children are not explicitly taught about these patterns. Children appear to induce the patterns on their own from seeing words such as *sick* and *package* but not words like *ckan*.

More recent research has examined the extent to which children are able to deal with more sophisticated orthographic patterns. Hayes, Treiman, and Kessler (2006) asked whether spellers know that the choice between an extended spelling (e.g., *cull*, *peck*) and a nonextended spelling (*cool*, *peek*) of a final consonant is often determined by the preceding vowel. Their study included children in the second, third, and fifth grades, as well as adults. Participants in each age group exhibited sensitivity to the preceding vowel context in both a nonword spelling task and a word-likeness task involving pairs of nonwords. For example, the participants preferred *thull* over *thul*, *thool* over *thooll*, *gack* over *gak*, and *goak* over *goack*. Sensitivity to these patterns increased across the age groups. Hayes et al. also examined participants’ ability to use the following vowel in selecting a spelling for initial /k/. In a nonword spelling task, participants were more likely to use *k* in items where the following vowel was a short *e* or *i* (as in the real words *kept* and *kit*) than in items that had another vowel but that were otherwise identical. This effect, which reflects sensitivity to the orthographic patterns of English, was similar in magnitude across age groups.

Other work has examined children’s ability to use consonants in selecting spellings for vowels. Consider that /a/ is typically spelled as *a* when preceded by /w/ (as in *wand*), and as *o* when preceded by other consonants (as in *pond*). Similarly, /i/ is typically spelled as *ee* when followed by /p/ (as in *creep*) and as *ea* when followed by /m/ (as in *cream*). Treiman and Kessler (2006; see also Varnhagen, Boechler, & Steffler, 1999)

studied children's sensitivity to preceding and following consonants in a nonword spelling task. Participants' spelling levels ranged from kindergarten through high school. Treiman and Kessler found that children spelling at the fourth-grade level were sensitive to preceding-consonant context, while sensitivity to following-consonant context did not emerge until the seventh-grade spelling level. Some complex patterns, therefore, are not mastered until learners have had rather extensive experience with the spelling system. Performance could perhaps be improved if spellers' attention were drawn to how context can aid in the selection among alternative spellings for a given sound, something that is not systematically done in many classrooms.

Morphological Knowledge

The English writing system is typically considered an alphabetic, albeit irregular, system. For words that contain more than one *morpheme* or unit of meaning, however, English often deviates systematically from the alphabetic principle. For example, one would expect *health* to be spelled as *helth* based on the sounds that it contains. The conventional spelling, though, indicates the similarity in meaning between *health* and *heal*. As another example, *jumped* and *hemmed* end with different sounds, /t/ for *jumped* and /d/ for *hemmed*. The final sounds of the two words, although different, are both forms of the past tense morpheme. As such, both are spelled *ed*.

It takes some time for children to learn how certain morphological conventions are reflected in spelling. For example, the third through sixth graders tested by Waters, Bruck, and Malus-Abramowitz (1988) had difficulty spelling words like *sign*. The correct spelling of this word can be predicted if one relates it to *signal*, which has the same root; the word is unlikely to be spelled correctly otherwise. Zutell (1980) found that fourth graders had difficulty spelling *reduced* vowels in morphologically complex words. An example of such a reduced vowel is the second vowel in *inflammation*, which comes from *inflame*. Finally, Carlisle (1988) found that fourth and sixth graders had difficulty spelling morphologically complex words such as *equality*.

The examples outlined above involve *derivational* relations that feature considerable differences in pronunciation and stress within the derived word–base form pair. For example, pronunciation and stress change when the noun *equality* is derived from the verb/adjective *equal*. Other research has shown that young children can use morphology to aid spelling in simpler derivational contexts. One example involves medial *flaps*. When pronounced in North American English, the words *dirty* and *duty* do not contain a clear medial /t/. Rather, the tongue taps rapidly against the top of the mouth to produce a flap. Flaps are *voiced* (the vocal cords vibrate during their production), and as such are more similar to /d/ (voiced) than /t/ (unvoiced). Consider a young child who is faced with the task of spelling the flaps of *dirty* and *duty*. Such a child should produce more accurate spellings for the flap of *dirty* if he or she relates this word to its base form, *dirt*. Treiman, Cassar, and Zukowski (1994) found this to be the case for children as young as six years of age.

Early use of morphology is also evident in children's spellings of the roots in *inflected* forms. Inflected forms involve relatively simple changes such as the addition of past

tense and plural markers; phonology and part of speech do not change to the extent that they sometimes do with derived forms. We discussed earlier the segmentation problem that arises for words such as *brand* that end with consonant clusters. If children's phonological segmentation skills are insufficient to allow them to conceptualize a separate /n/ in the spoken form of *brand*, they might produce misspellings like "brad." However, such children may be able to include an *n* when spelling an inflected two-morpheme word like *tuned* if they relate this word to its base form, *tune*. Indeed, Treiman and Cassar (1996) found that first graders were significantly more likely to symbolize the first segment of a final consonant cluster with an appropriate letter when a base form existed that could aid their spelling, as with *tuned*, than when no such base form existed, as with *brand*.

More recent research has confirmed that young children's spellings show a sensitivity to root morphemes in morphologically complex words and has pointed to differences as a function of linguistic complexity. Deacon and Bryant (2006) found that six- to eight-year-old children were more likely to fill in the first sections of words correctly in inflected and derived words than in control counterparts. For example, children showed more accurate spelling of *turn* in *turning* than in *turnip* and more accurate spelling of *even* in *evenly* than in *evening*. Although Deacon and Bryant found no difference between the inflected and derived conditions, follow-up work examining performance on both first section and full word spelling tasks revealed greater use of morphology with inflected than derived words (Deacon, in press).

Children's performance on suffixes also varies as a function of linguistic complexity. Deacon and Bryant (2005) found that six- to eight-year-olds were more likely to fill in the last sections of words correctly in inflected words than in control counterparts (e.g., more accurate spelling of *er* in *smarter* than in *corner*); no such difference was observed for derived words and their counterparts (e.g., equally accurate spelling of *ness* in *kindness* and *witness*). Even with inflections, though, children may overextend morphological spelling strategies they have learned. For example, Nunes, Bryant, and Bindman (1997) found that young children sometimes make errors such as "sleped" for *slept*. The findings of Nunes et al. point to the complexity of certain morphological relations. Children must master not only the broad regularities of the morphological system but also the exceptions and the less common patterns. Indeed, we have seen that the ability to use some aspects of morphology in spelling takes considerable time to develop.

Conclusions and Implications

A number of theories of spelling development (e.g., Ehri, 1986; Gentry, 1982; Henderson, 1985) emphasize that children's spellings are initially rooted in phonology. Beginning spellers go through a period during which they progress through each word from left to right, using their knowledge of phoneme-grapheme correspondences and letter names to represent the word's sounds. During later stages of development, additional higher-level sources of information come into play, including knowledge of orthographic patterns and morphological relationships. These latter types of knowledge

are thought to be unavailable to beginning spellers. The research reviewed here suggests that these views of spelling development are too limited. Even beginning spellers use various knowledge sources—not just phonological knowledge, but orthographic and morphological knowledge as well—to guide their spellings (see also Rittle-Johnson & Siegler, 1999; Kwong & Varnhagen, 2005; Varnhagen, McCallum, & Burstow, 1997; Wright & Ehri, 2007). Moreover, as we have seen, the three types of knowledge are not homogeneous in nature. Within each domain, children progress from simple to increasingly complex patterns. It is not accurate to say that all orthographic patterns or all morphological patterns are learned at the same time.

Future investigations of the linguistic factors that influence spelling performance will continue to provide a clearer picture of spelling development. These fine-grained analyses of children's spelling performance will enable practitioners to understand why developmental differences exist and to identify the trouble spots that require particular attention in spelling instruction. This type of pattern-based instructional approach will best equip children with the skills required for optimal spelling performance.

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