Progress in Reading Instruction Requires a Better Understanding of the English Spelling System

Jeffrey S. Bowers[1] and Peter N. Bowers[2]

[1]School of Psychological Science, University of Bristol, and [2]WordWorks Literacy Centre,
Wolfe Island, Ontario, Canada

Abstract

It is widely claimed that the English spelling system conforms to the *alphabetic principle*, according to which letters or letter combinations (graphemes) represent speech sounds (phonemes). But this is not accurate. English spellings have evolved to represent both phonemes and meaning (through morphology and etymology), and in direct contradiction to the alphabetic principle, spellings prioritize the consistent spelling of morphemes over the consistent spellings of phonemes. This is important because the alphabetic principle provides the main theoretical motivation for systematic phonics instruction that explicitly teaches children grapheme–phoneme correspondences in English without reference to morphology and etymology. Furthermore, this theoretical claim has biased the research literature, with many studies considering the efficacy of phonics but few studies assessing the relevance of morphology and etymology to reading instruction. We briefly describe the linguistic organization of the English spelling system and then outline pedagogical and empirical arguments in support of the hypothesis that reading instruction should be designed to teach children the logical and meaningful organization of English spellings.

Keywords

phonics, reading, structured word inquiry, alphabetic principle

There is an overwhelming consensus in the research community that systematic phonics is the best practice for early reading instruction in English. That is, children should be explicitly taught the associations between graphemes and phonemes before learning other aspects of their writing system, including the important role that meaning plays in organizing spellings (through morphology and etymology).

This widespread conclusion is based on both theory and data. With regard to theory, it is commonly claimed that English has an alphabetic writing system in which letters and letter combinations (graphemes) represent speech sounds (phonemes). Indeed, more than 11,000 articles have included the phrase "alphabetic principle" (as of January 2018, according to Google Scholar), and this principle is commonly used to motivate phonics instruction for English-speaking children. The logic of the argument is straightforward: Children should be taught the logic of their writing system, and phonics, with its emphasis on grapheme–phoneme correspondences, is thought to do just that (e.g., Snowling & Hulme, 2011).

With regard to data, there are now multiple meta-analyses that are claimed to provide strong support for systematic phonics compared with a variety of alternative methods (e.g., Galuschka, Ise, Krick, & Schulte-Körne, 2014; McArthur et al., 2012; National Reading Panel, 2000; Torgerson, Brooks, & Hall, 2006). This combination of theory and data has not only led to the widespread view that phonics is the best practice for early reading instruction, but it has also led to major policy changes for teaching. For example, systematic phonics is now legally mandated in all state schools in England and is part of U.S. education policy, with phonics part of the core curriculum in programs such as Early Reading First.

We challenge this consensus. We show that the alphabetic principle does not reflect the conventions of the English writing system and highlight how this

Corresponding Author:
Jeffrey S. Bowers, University of Bristol, School of Psychological Science, 12a Priory Rd., Bristol, BS8-1TU, United Kingdom
E-mail j.bowers@bristol.ac.uk

misunderstanding has strongly constrained the research that has been carried out. We outline an alternative hypothesis that children should be taught the logic of their writing system.

The English Writing System Is Morphophonemic, Not Alphabetic

The obvious problem with the claim that English spellings are alphabetic is that many words are inconsistent with this hypothesis. For example, approximately 16% of the monosyllabic words included in the *Children's Printed Word Database* (Masterson, Stuart, Dixon, & Lovejoy, 2010) are irregular in the sense that they have unexpected pronunciations according to the grapheme–phoneme correspondences taught in phonics, and additional sources of inconsistencies arise in multisyllabic and multimorphemic words (Mousikou, Sadat, Lucas, & Rastle, 2017). The mappings between phonemes and graphemes (used for spelling rather than reading) are even more irregular, with Crystal (2003) estimating that only 56% of English spellings can be derived from phoneme–grapheme correspondences.

One response to these exceptions would be to reject the hypothesis that English spellings are alphabetic and consider other organizing principles. However, a more common response is to acknowledge that English spellings are not perfectly alphabetic but nevertheless claim that they are close. For example, Byrne (1998) wrote that "inconsistencies and irregularities in English spelling abound. . . . Nevertheless, English is fundamentally an alphabetic language" (p. 2).

This perspective is commonplace and used to motivate phonics despite the many irregularities (e.g., Adams, 1990; Byrne, 1998; Duff, Mengoni, Bailey, & Snowling, 2015; Taylor, Davis, & Rastle, 2017; Wyse & Goswami, 2008). But this is a mistake. English is a morphophonemic system that evolved to jointly represent units of meaning (morphemes) and phonology (phonemes). As Venezky (1967) put it, "the simple fact is that the present orthography is not merely a letter-to-sound system riddled with imperfections, but, instead, a more complex and more regular relationship wherein phoneme and morpheme share leading roles" (p. 77). The key phrase here is that "phoneme and morpheme share leading roles."

To illustrate, consider Figure 1a, which depicts the morphological family associated with the base <act>. In spoken English, speakers are exposed to varied pronunciations of this base depending on the word in which it is found: /ækt/ (in *actor* and *acting*), but /ækʃ/ in *action*. The spelling <act>, however, remains consistent. The fact that the grapheme <t> in *act* and *action* maps onto different pronunciations is not evidence of a poor
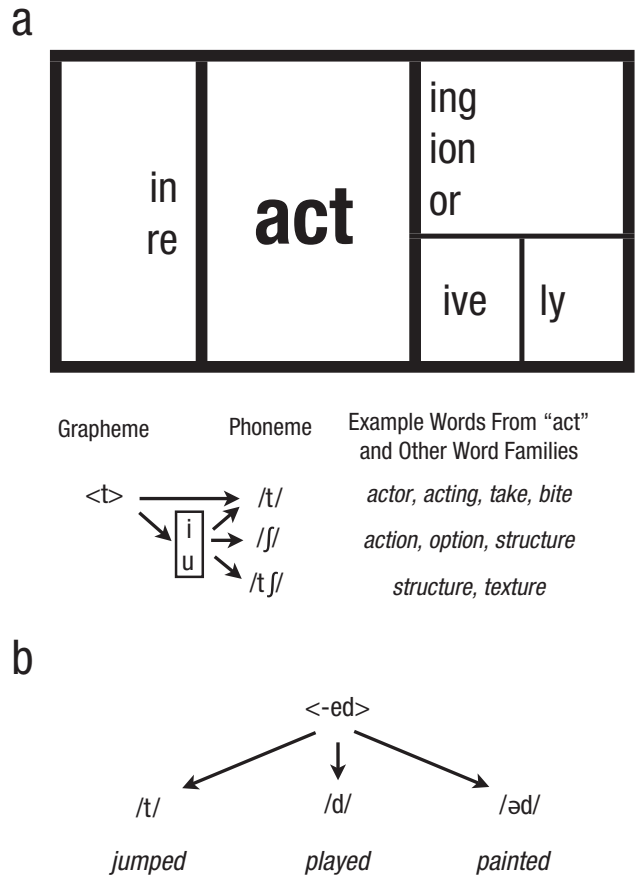
Fig. 1. Morphological matrix for the base <act> (a) and three different pronunciations of the <-ed> suffix (b). The spelling of the base <act> is consistent across all members of the morphological family despite pronunciation shifts of the base in some family members (e.g., *active* vs. *action*). In the examples in both (a) and (b), English prioritizes the consistent spelling of morphemes over phonemes. The diagram below the <act> matrix shows grapheme–phoneme correspondences associated with the <t> grapheme. The default pronunciation of this grapheme is /t/, but when followed immediately by the letters <i> or <u>, it can represent other phonemes: The /ʃ/ phoneme (often described as the "sh sound" in phonics) or the /tʃ/ phoneme (often described as the "ch sound" in phonics). In structured word inquiry, such diagrams are a basic feature of explicit instruction about grapheme–phoneme correspondence in the context of morphological relatives. This allows for understanding of the particular grapheme choice in a word in reference to the varied pronunciations of a morpheme across related words. Note that this diagram shows that the <t> grapheme in *structure* can represent common pronunciations of this word that include the /tʃ/ and /ʃ/ phoneme. The spelling <action> cannot be understood through instruction that teaches grapheme–phoneme correspondences without reference to morphology.

spelling system; rather, it is evidence that English spelling encodes morphology in a consistent manner. Or consider Figure 1b, which shows the consistent spelling of the <-ed> suffix in *jumped, played*, and *painted*, despite the fact that <-ed> is associated with the pronunciations /t/, /d/ and /əd/, respectively. Again, morphology rather than phonology is spelled consistently.

These are not cherry-picked examples: English prioritizes the consistent spelling of morphemes over the consistent spellings of phonemes. Indeed, in order to spell morphemes in a consistent manner, it is necessary to have inconsistent (or perhaps a better term is "flexible") grapheme–phoneme correspondences. A language that prioritizes the consistent spelling of morphemes over phonemes is not "fundamentally alphabetic."

Etymology also imposes semantic constraints on English spelling that are ignored by the alphabetic principle. For example, consider the <w> in the spelling *two*. This <w> has no phonological role—therefore, it is not a grapheme. Instead, it is an etymological marker that signals a connection in meaning between *two* and related words in which the <w> is a grapheme (e.g., *twin, twice*), and it distinguishes the spelling of *two* from its homophones (*to, too*). This latter case illustrates the homophone principle, namely, that when two words share a pronunciation, they tend to differ in spelling to signal a difference in meaning (Venezky, 1999). If the English spelling system were fundamentally alphabetic, then most homophonic words should be spelled the same. For a more detailed review of the logic of the English spelling system, including a more thorough description of etymology and morphology, see J. S. Bowers and Bowers (2017).

The Mischaracterization of the English Spelling System Has Constrained Research

The widespread claim that English spellings are alphabetic has led to many studies that have assessed the efficacy of phonics but relatively few studies that have assessed the efficacy of morphological instruction; even fewer studies have assessed the efficacy of teaching the interrelation between morphology, etymology, and phonology (J. S. Bowers & Bowers, 2018a, 2018b). To illustrate, consider the influential National Reading Panel (2000) study, which concluded that systematic phonics is better than alternative reading methods. In 449 pages, the word "phoneme" occurs 294 times, "alphabetic" 80 times, and "alphabetic principle" 4 times, whereas "morpheme" occurs once (derivations of "morpheme" a total of 4 times). In more recent meta-analyses and reviews taken to support phonics (Galuschka et al., 2014; McArthur et al., 2012; Rose, 2006, 2009), and a recent meta-analysis that failed to find any long-term benefits of phonics (Suggate, 2016), there are no occurrences of the word "morpheme." As long as most researchers characterize English spellings as alphabetic, little research will investigate the hypothesis that reading instruction should be informed by the fact that English spellings are logical and make sense.

Nevertheless, a small but growing literature has assessed the impact of morphological instruction on reading. The main conclusion from reviews and meta-analyses is that morphological instruction produces a moderate improvement on literacy achievement across a range of tasks and student populations, with the strongest effects observed for younger children and struggling readers (e.g., P. N. Bowers, Kirby, & Deacon, 2010; Goodwin & Ahn, 2013). Nevertheless, there is room for improvement in these studies. For example, P. N. Bowers et al. (2010) reported that of the 22 studies in their meta-analysis, only 4 targeted the fact that the spellings of a base within a morphological family are consistent despite pronunciation changes (as in *sign* and *signal*). That is, most morphological interventions failed to teach children the key insight that English spellings favor the consistent spelling of morphemes rather than the consistent spelling of phonemes, and accordingly, children were not taught how spellings represent both morphemes and phonemes.

To summarize, there is some evidence that phonics is better than common alternative methods of reading instruction, but there is no evidence that phonics is more effective than instruction that includes morphological content from the start (J. S. Bowers & Bowers, 2018b). It is also important to emphasize that the evidence for phonics compared with evidence for common alternative methods is not as strong as commonly claimed (cf. National Reading Panel, 2000, with Camilli, Wolfe, & Smith, 2006). Indeed, a recent meta-analysis showed no long-term benefits of phonics (Suggate, 2016), and a recent systematic review of all meta-analyses identified some serious problems with the existing research (Torgerson, Brooks, Gascoine, & Higgins, 2018). Accordingly, it is important to consider alternative methods of instruction.

New Directions in Reading Instruction

We have been advancing the hypothesis that reading instruction, from the start, should focus on teaching the logic of the writing system. In this way, reading instruction can be designed much like instruction in other systematic domains that are studied scientifically (e.g., biology, physics). That is, children can be engaged in generating and testing hypotheses about how the system works (J. S. Bowers & Bowers, 2017; Kirby & Bowers, 2017). P. N. Bowers and Kirby (2010) called this approach *structured word inquiry*, or SWI. This approach contrasts with morphological interventions, which do not consider the interrelation between morphology, etymology, and phonology and which do not emphasize the role of testing hypotheses about how the system works.

To avoid any confusion, it is important to emphasize that the explicit instruction of orthographic phonology—how

Level

1
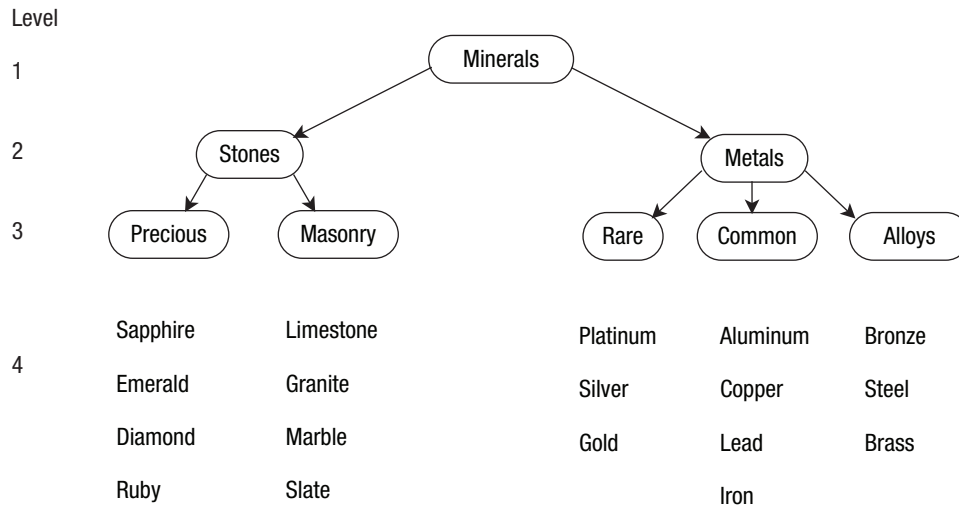
Fig. 2. A set of to-be-remembered words (taken from Bower, Clark, Lesgold, & Winzenz, 1969) organized in a hierarchy that highlights the meaningful relations among the words. Words displayed in this format were better remembered than in a condition in which words were randomly placed within the hierarchy so that the meaningful relations were obscured.

grapheme–phoneme correspondences work—is a core feature of SWI. However, unlike phonics, SWI considers grapheme–phonemes within the context of morphology and etymology. For example, consider the crucial role of morphology for understanding the grapheme–phoneme correspondences in the word *react*. Absent morphology, it is not possible to determine the graphemic structure of the <ea> letter sequence: Is the <ea> a digraph corresponding to a single phoneme (pronounced /iː/), or two graphemes associated with distinct phonemes? Morphology clarifies the phonology. The word *react* has the morphological structure <re + act>, and this rules out <ea> as a digraph because graphemes never cross morphemic boundaries. Successful application of learning from SWI negates the mispronunciation /riːkt/ (homophonous with *reeked*), while successful application of phonics learning makes *reeked* and *react* equally plausible readings. More generally, the morphological context provides an explanation as to why specific grapheme–phoneme correspondences occur in words (e.g., why the word *action* includes the <t> rather than the <sh> grapheme to represent the /ʃ/ of *action*).

Although the SWI characterization of the English orthographic system is linguistically uncontroversial, why should SWI be taken seriously as a potential alternative to phonics in a classroom context? Most importantly, there are pedagogical arguments that strongly motivate this approach. Shulman (1986) argued that teachers with a better understanding of their subject matter are in a better position to exploit a variety of pedagogical techniques within that given domain, what

he called *pedagogical content knowledge*. In the case of SWI, a better content knowledge of the English spelling system allows teachers to exploit two of the most powerful insights from psychology for improving learning and memory.

First, SWI can exploit the finding that learning is best when information is encoded in an elaborative and organized manner. For example, Bower, Clark, Lesgold, and Winzenz (1969) carried out a memory experiment in which words were organized within a hierarchy that highlighted the meaningful relations among the words, as depicted in Figure 2. Memory was approximately three times better in this condition compared with a condition that did not highlight these relations. SWI (but not phonics) can exploit this insight because children learn about the meaning-bearing elements of words (morphemes) and learn to organize words into morphological families that share meanings and spellings. Organizing words into morphological families using matrices (as in Fig. 1) highlights this organization, much like the hierarchies used by Bower et al. (1969).

Second, SWI can exploit the finding that memory and learning benefit from a strategy called *elaborative interrogation*, in which learning is better when children generate plausible explanations as to why some stated fact is true (Dunlosky, Rawson, Marsh, Nathan, & Willingham, 2013). This insight is again easily exploited by SWI. For instance, children can be presented with lists of words (e.g., *play*, *playful*, *replay*, *plays*, *plane*, *playmate*, and *say*) and investigate the structure and meaning of these words in order to generate and test hypotheses about which words belong to a common

morphological family, which do not, and why. Or children can make sense of why *does* is spelled <does> rather than *<duz> or why there is a <g> in *sign*, or explain countless other spellings that cannot be understood via the alphabetic principle (see Kirby & Bowers, 2017, for more practical illustrations of SWI).

Furthermore, there are good reasons to think that SWI can address the main criticism of phonics, namely, the view that an emphasis on grapheme–phoneme correspondences is not engaging for many children. For example, when discussing the disappointing results of some phonology-based intervention studies, Snowling and Hulme (2014) argued that intervention studies need to focus more on pupil motivation, with the aim of increasing students' enjoyment of reading. We would suggest that SWI is a promising approach in this respect, given that it aims to give children an understanding of the meaningful organization of the writing system through word investigations. As noted by Dunlosky et al. (2013), "Anyone who has spent time around young children knows that one of their most frequent utterances is 'Why?'" (p. 8). Indeed, nothing motivates like understanding.

In addition to these pedagogical considerations, it is important to note that there is preliminary empirical evidence that SWI improves decoding (Devonshire, Morris, & Fluck, 2013), spelling (Devonshire & Fluck, 2010), and vocabulary knowledge (P. N. Bowers & Kirby, 2010). This highlights the promise of SWI to improve a wide range of literacy skills, consistent with teaching children the role that both phonology and semantics play in shaping English spellings. Importantly, the Devonshire et al. (2013) study found SWI to be more effective than phonics in children between the ages of 5 and 7, suggesting that SWI can be introduced at the very start of instruction. We do not want to make too much of this empirical evidence, given that so few studies have been carried out thus far. But in combination with the strong pedagogical considerations, we would argue that SWI is a highly promising approach that deserves more attention. In order to illustrate how SWI can be implemented at the start of instruction, there are several videos available that document SWI instruction in preschool (https://vimeo.com/189070725) and kindergarten (https://www.youtube.com/watch?v=VW8in2AIPy8&t=8s).

Summary

Our main point is to highlight that reading instruction has been guided by a fundamental misunderstanding of the English spelling system and that this has had a profound impact on the type of research that has been carried out. This is problematic, given that a plausible alternative to phonics is that reading instruction should be informed by an accurate characterization of English spellings, consistent with the more general claim that an understanding of the subject matter can inspire better teaching methods (i.e., the use of so-called *pedagogical content knowledge*). In our view, a key priority for reading research is to directly compare phonics with SWI or other approaches to reading instruction that emphasize the fact that word spellings are organized by phonology and meaning.

Recommended Reading

Bowers, J. S., & Bowers, P. N. (2017). (See References). Provides a detailed argument for structured word inquiry, including a tutorial on the English spelling system.

Bowers, J. S., & Bowers, P. N. (2018a). (See References). Shows how arguments for phonics are often based on mischaracterizing the English spelling system.

Bowers, P. N., & Kirby, J. R. (2010). (See References). Shows that structured word inquiry is an effective method of vocabulary instruction.

Devonshire, V., Morris, P., & Fluck, M. (2013). (See References). Reports that structured word inquiry is more effective than phonics for early reading instruction.

Action Editor

Randall W. Engle served as action editor for this article.

Acknowledgments

Declaration of Conflicting Interests

P. N. Bowers runs the company WordWorks, where he uses structured word inquiry to work with students, teachers, and schools. Both authors declared that there were no other conflicts of interest with respect to the authorship or the publication of this article.

References

Adams, M. J. (1990). *Beginning to read: Thinking and learning about print*. Cambridge, MA: The MIT Press.

Bower, G. H., Clark, M. C., Lesgold, A. M., & Winzenz, D. (1969). Hierarchical retrieval schemes in recall of categorized word lists. *Journal of Verbal Learning and Verbal Behavior*, *8*, 323–343. doi:10.1016/S0022-5371(69)80124-6

Bowers, J. S., & Bowers, P. N. (2017). Beyond phonics: The case for teaching children the logic of the English spelling system. *Educational Psychologist*, *52*, 124–141. doi:10.1080/00461520.2017.1288571

Bowers, J. S., & Bowers, P. N. (2018a). The importance of correctly characterising the English spelling system when devising and evaluating methods of reading instruction: Comment on Taylor, Davis, and Rastle (2017). *Quarterly Journal of Experimental Psychology*, *71*, 1497–1500. doi:10.1177/1747021818759477

Bowers, J. S., & Bowers, P. N. (2018b). There is no evidence to support the hypothesis that systematic phonics should precede morphological instruction: Response to Rastle and colleagues. *PsyArXiv*. doi:10.31234/osf.io/zg6wr

Bowers, P. N., & Kirby, J. R. (2010). Effects of morphological instruction on vocabulary acquisition. *Reading and Writing: An Interdisciplinary Journal*, *23*, 515–537. doi:10.1007/s11145-009-9172-z

Bowers, P. N., Kirby, J. R., & Deacon, S. H. (2010). The effects of morphological instruction on literacy skills: A systematic review of the literature. *Review of Educational Research*, *80*, 144–179. doi:10.3102/0034654309359353

Byrne, B. (1998). *The foundation of literacy: The child's acquisition of the alphabetic principle*. New York, NY: Psychology Press.

Camilli, G. M., Wolfe, P., & Smith, M. L. (2006). Meta-analysis and reading policy: Perspectives on teaching children to read. *The Elementary School Journal*, *107*, 27–36.

Crystal, D. (2003). *The Cambridge encyclopedia of the English language* (2nd ed.). Cambridge, England: Cambridge University Press.

Devonshire, V., & Fluck, M. (2010). Spelling development: Fine-tuning strategy-use and capitalising on the connections between words. *Learning and Instruction*, *20*, 361–371. doi:10.1016/j.learninstruc.2009.02.025

Devonshire, V., Morris, P., & Fluck, M. (2013). Spelling and reading development: The effect of teaching children multiple levels of representation in their orthography. *Learning and Instruction*, *25*, 85–94. doi:10.1016/j.learninstruc.2012.11.007

Duff, F. J., Mengoni, S. E., Bailey, A. M., & Snowling, M. J. (2015). Validity and sensitivity of the phonics screening check: Implications for practice. *Journal of Research in Reading*, *38*, 109–123.

Dunlosky, J., Rawson, K. A., Marsh, E. J., Nathan, M. J., & Willingham, D. T. (2013). Improving students' learning with effective learning techniques: Promising directions from cognitive and educational psychology. *Psychological Science in the Public Interest*, *14*, 4–58. doi:10.1177/1529100612453266

Galuschka, K., Ise, E., Krick, K., & Schulte-Körne, G. (2014). Effectiveness of treatment approaches for children and adolescents with reading disabilities: A meta-analysis of randomized controlled trials. *PLOS ONE*, *9*(2), Article e89900. doi:10.1371/journal.pone.0089900

Goodwin, A. P., & Ahn, S. (2013). A meta-analysis of morphological interventions in English: Effects on literacy outcomes for school-age children. *Scientific Studies of Reading*, *17*, 257–285. doi:10.1080/10888438.2012.689791

Kirby, R. J., & Bowers, P. N. (2017). Morphological instruction and literacy: Binding phonological, orthographic, and semantic features of words. In K. Cain, D. Compton, & R. Parrila (Eds.), *Theories of reading development* (pp. 437–461). Amsterdam, The Netherlands: John Benjamins. doi:10.1075/swll.15.24kir

Masterson, J., Stuart, M., Dixon, M., & Lovejoy, S. (2010). Children's printed word database: Continuities and changes over time in children's early reading vocabulary. *British Journal of Psychology*, *101*, 221–242. doi:10.1348/000712608X371744

McArthur, G., Eve, P. M., Jones, K., Banales, E., Kohnen, S., Anandakumar, T., . . . Castles, A. (2012). Phonics training for English-speaking poor readers. *Cochrane Database of Systematic Reviews*, Article CD009115. doi:10.1002/14651858.CD009115.pub2

Mousikou, P., Sadat, J., Lucas, R., & Rastle, K. (2017). Moving beyond the monosyllable in models of skilled reading: Mega-study of disyllabic nonword reading. *Journal of Memory and Language*, *93*, 169–192.

National Reading Panel. (2000). *Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction*. Bethesda, MD: National Institute of Child Health and Human Development.

Rose, J. (2006). *Independent review of the teaching of early reading*. Nottingham, England: Department of Fire & Emergency Services Publications.

Rose, J. (2009). *Identifying and teaching children and young people with dyslexia and literacy difficulties*. London, England: Department for Children, Schools and Families.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, *15*, 4–14.

Snowling, M. J., & Hulme, C. (2011). Evidence-based interventions for reading and language difficulties: Creating a virtuous circle. *British Journal of Educational Psychology*, *81*, 1–23. doi:10.1111/j.2044-8279.2010.02014.x

Snowling, M. J., & Hulme, C. (2014). Closing a virtuous circle: Reciprocal influences between theory and practice in studies of reading intervention. *Journal of Research on Educational Effectiveness*, *7*, 300–306. doi:10.1080/19345747.2014.925307

Suggate, S. P. (2016). A meta-analysis of the long-term effects of phonemic awareness, phonics, fluency, and reading comprehension interventions. *Journal of Learning Disabilities*, *49*, 77–96.

Taylor, J. S. H., Davis, M. H., & Rastle, K. (2017). Comparing and validating methods of reading instruction using behavioural and neural findings in an artificial orthography. *Journal of Experimental Psychology: General*, *146*, 826–858.

Torgerson, C., Brooks, G., Gascoine, L., & Higgins, S. (2018). Phonics: Reading policy and the evidence of effectiveness from a systematic 'tertiary' review. *Research Papers in Education*. Advance online publication. doi:10.1080/02671522.2017.1420816

Torgerson, C. J., Brooks, G., & Hall, J. (2006). *A systematic review of the research literature on the use of phonics in the teaching of reading and spelling* (Department of Fire & Emergency Services Research Report No. 711). London, England: Department for Education and Skills, University of Sheffield.

Venezky, R. L. (1967). English orthography: Its graphical structure and its relation to sound. *Reading Research Quarterly*, *2*(3), 75–105.

Venezky, R. L. (1999). *The American way of spelling: The structure and origins of American English orthography*. New York, NY: Guilford.

Wyse, D., & Goswami, U. (2008). Synthetic phonics and the teaching of reading. *British Educational Research Journal*, *34*, 691–710.