The Theory, Research and Practice of Structured Word Inquiry (SWI)

**Instruction** which builds understanding of word **structure** as a tool for investigating the interrelation of spelling and meaning.

structured

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WordWorks Literacy Centre,
2021
Structured Word Inquiry: Developing literacy and critical thinking by scientific inquiry about how spelling works

Taking another look at English Orthography

The word looks different depending upon where you stand when you look at it. Let’s begin by establishing the standard ‘view’…

The term ‘systematic phonics’ describes practices for teaching decoding and word reading. It teaches students the correspondences between graphemes (letters and letter clusters) in written words and phonemes (speech sounds) in spoken words, and how to use these grapheme-phoneme correspondences to read and spell. Phonics instruction is systematic when it teaches the major grapheme-phoneme correspondences in a planned sequence.

(Buckingham, 2020, p. 2)

On ‘alphabetic principle’ from www.readingrockets.org

What is the "alphabetic principle"?

Children's reading development is dependent on their understanding of the alphabetic principle – the idea that letters and letter patterns represent the sounds of spoken language. Learning that there are predictable relationships between sounds and letters allows children to apply these relationships to both familiar and unfamiliar words, and to begin to read with fluency.

The goal of phonics instruction is to help children to learn and be able to use the Alphabetic Principle. The alphabetic principle is the understanding that there are systematic and predictable relationships between written letters and spoken sounds. Phonics instruction helps children learn the relationships between the letters of written language and the sounds of spoken language.

Two issues of importance in instruction in the alphabetic principle are the plan of instruction and the rate of instruction.

The alphabetic principle plan of instruction

- Teach letter-sound relationships explicitly and in isolation.
- Provide opportunities for children to practice letter-sound relationships in daily lessons.
- Provide practice opportunities that include new sound-letter relationships, as well as cumulatively reviewing previously taught relationships.
- Give children opportunities early and often to apply their expanding knowledge of sound-letter relationships to the reading of phonetically spelled words that are familiar in meaning.

As I argue in Bowers (2021), I know of no published definition of phonics which makes any mention of the role of morphology or etymology for grapheme choice or any phonological level. Thus, instructional suggestions based on phonics fail to help learners understand how to understand why a given word uses one grapheme over another when more than one is possible.

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**Common Ground:**
*Both Systematic Phonics instruction and SWI instruction agree*

- Those learning to read deserve the best possible explicit instruction about grapheme-phoneme correspondences.

**QUESTION**
- Based on published definitions of phonics instruction, how does a learner understand which grapheme is needed for a word when, (a) more than one is possible, or (b) a word does not follow the grapheme-phoneme correspondences it teaches?

**ANSWER:** Memorization only option.
Wouldn’t it be better if instruction could *explain* such spellings?

<table>
<thead>
<tr>
<th>attested spelling</th>
<th>Spelling errors applying ‘letter-sound’ correspondences taught in phonics</th>
</tr>
</thead>
<tbody>
<tr>
<td>every</td>
<td>*ëvry</td>
</tr>
<tr>
<td>does</td>
<td>*duz, *dose</td>
</tr>
<tr>
<td>action</td>
<td>*acshun</td>
</tr>
<tr>
<td>really</td>
<td>*realy, *reely, *reelly</td>
</tr>
<tr>
<td>society</td>
<td>*susiety, *sucietee, *sociaty…</td>
</tr>
<tr>
<td>there</td>
<td>their, they’re (homophones)</td>
</tr>
</tbody>
</table>

In SWI, all of these spellings can be *understood* and explained by teaching the interrelation of morphology etymology and phonology.
Understanding how the written word works

Wandering planets

Ptolemy's Geocentric model
ge + o + centre/ + ic
“earth at the centre”

Copernicus Heliocentric model
heli + o + centre/ + ic
“sun at the centre”

Contradictions mark where scientists should dig!

Click HERE for Pete’s TEDx talk going through similar slides to describe this analogy

In schools:
“English spelling represents sounds, but many exceptions.”

In linguistics: Morphemic consistency
Orthography favours consistent spelling of meaning (e.g. morphemes) over consistent spelling of phonology.

Morphology and phonology of the < do > and < go > morphological families

“English orthography is not a failed phonetic transcription system, invented out of madness or perversity. Instead, it is a more complex system that preserves bits of history (i.e., etymology), facilitates understanding and also translates into sound.”

(Venezky, 1999, P.4)

Click HERE to watch the video of Pete teaching the spelling of <does> with the matrix and word sum - not only to explain this spelling - but to introduce students who the basic principle of morphemic consistency that drives the entire spelling system. Note, there is no way to teach this concept in any instruction which does not explicitly teach the INTERRELATION of morphology and phonology. Since published definitions of phonics teaches grapheme-phoneme correspondences in isolation of morphology and phonology, children are taught to memorize spellings like ‘does’ (and countless others) as ‘exceptions’ to ‘letter-sound correspondences’ and thus words that have to be memorized.
A Basic Assumption of Literacy Instruction

Learners deserve instruction that represents how their writing system works.

- **English is morphophonic**
  (Venezky, 1999; C. Chomsky, 1970; Pinker, 1999)
  “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.”

  Venezky, 1967, p. 77

Can you think of common ways instruction reflects how orthography represents the interrelation of morphemes and phonemes?

A Basic Assumption of Literacy Instruction

Learners deserve instruction that represents how their writing system works.

Clearly **some** disconnect between the nature of English spelling and how typical instruction represents it.

A sign of a rich area to target instructional research…

- Effect of **including** instruction about morphology?
- Effect of teaching the **interrelation** of morphology and phonology?
- Effects for different groups?
  - Less able / typical / advanced
  - Younger / older

The ‘reading brain’ — the Triangle Model based on Seidenberg & McClelland (1989)

**Orthographic mapping (OM) involves the formation of letter-sound connections to bond the spellings, pronunciations, and meanings of specific words in memory.”** [emphasis added]

Ehri’s (2014) “Orthographic Mapping in the Acquisition of Sight Word Reading, Spelling Memory, and Vocabulary Learning”
Kirby and Bowers (2017) present theory of ‘morphology as a binding agent’ thus as a key feature of Perfetti’s lexical quality (2007) that is involved in the creation of a word’s identity in the mind (‘sight words’ in orthographic mapping). Morphology is the only feature of language that have spellings, pronunciations and meanings associated with them.

Bowers & Kirby, 2017

English orthography is fundamentally an interrelated system.

Graphemes are constrained by morphology.  

One reason <shop> cannot have the structure <sh + hop> is that no grapheme can cross a morphemic boundary.
On what basis is oral morphological knowledge cordoned off from first three stages?

<table>
<thead>
<tr>
<th>Prealphabetic</th>
<th>Partial Alphabetic</th>
<th>Full Alphabetic</th>
<th>Consolidated Alphabetic</th>
</tr>
</thead>
<tbody>
<tr>
<td>May or may not know letters</td>
<td>Most letter shapes and names known; incomm. knowledge of GPs</td>
<td>Major GP's of writing system known; full phonemic awareness: segmentation and blending</td>
<td>Grapho-syllabic spelling units known</td>
</tr>
<tr>
<td>Lack of phoneme awareness</td>
<td>Limited phonemic awareness; benefit of articulatory awareness instruction.</td>
<td>Complete phonemic awareness awareness: de</td>
<td>Grapho-syllabic connections predominates</td>
</tr>
<tr>
<td>No GP connections between spellings and pronunciations</td>
<td>Partial GP connections formed</td>
<td>Complete GP connections formed</td>
<td>Sight words learned primarily by grapho-syllabic connections</td>
</tr>
<tr>
<td>Sight words learned by remembering salient visual or context cues</td>
<td>Sight words learned by remembering complete GP connections</td>
<td>Sight words learned by remembering complete GP connections</td>
<td>sight word memory: accurate, automatic, unitized, growing, limited to shorter words</td>
</tr>
<tr>
<td>Sight word memory: unreliable, semantic errors, reading the environment</td>
<td>Confusion of similarly spelled words</td>
<td>Confusion of similarly spelled words</td>
<td>Confusion of similarly spelled words</td>
</tr>
<tr>
<td>No non-word decoding ability</td>
<td>Little or no non-word decoding ability</td>
<td>Growing ability to decode unfamiliar words and nonwords</td>
<td>Can decode unfamiliar words and nonwords proficiently</td>
</tr>
<tr>
<td>Cannot analyze</td>
<td>Analogizing precluded by partial memory for word spellings</td>
<td>Some use of analogizing but limited by smaller sight vocabulary</td>
<td>Greater use of analogizing as sight words accumulate</td>
</tr>
<tr>
<td>Unfamiliar words predicted from context</td>
<td>Unfamiliar words predicted using initial letters and context</td>
<td>Unfamiliar words predicted using initial letters and context</td>
<td>Unfamiliar words in context read by decoding: context used to confirm or disconfirm words read</td>
</tr>
<tr>
<td>Words spelled nonphonetically</td>
<td>Partial phonetic spellings invented; weak memory for correct spellings</td>
<td>Phonetically accurate GP spellings invented; growing memory for correct spellings</td>
<td>Grapho-syllabic and GP units to invent spellings; proficient memory for correct spellings</td>
</tr>
</tbody>
</table>

Note. Grapho-syllabic spelling units include subsyllabic units such as rime spellings, spellings of syllables, and spellings of morphemes including root words and affixes.

This table (without my annotations) is from Ehri (2014) Orthographic Mapping in the Acquisition of Sight Word Reading, Spelling Memory, and Vocabulary Learning. It is TABLE 1 titled “Summary of Word Reading and Spelling Abilities That Characterize Ehri’s (2005) Four Phases of Development”

Place of morphology in the development of word identity in the mind of the learner?

Orthographic Mapping claims morphology is only involved at the final stages of mapping the phonology, orthography and semantics of words.

Morphology as Binding Agent claims morphology plays a key role from beginning.

These theories have different predictions about the effect of morphological instruction for younger and less able readers.

An opportunity to test against empirical evidence.

“Grapho-syllabic spelling units include subsyllabic units such as rime spellings, spellings of syllables, and spellings of morphemes including root words and affixes”

Note that morphemes are treated as just one of several ‘grapho-syllabic spelling units’ including syllabic units’. This ignores the utterly unique feature that distinguishes morphemes from these other units. Only morphemes are meaning-bearing units. Syllables, onsets and rimes do not meaning.

Also, I see no basis on which it could be claimed that the oral morphological knowledge native English speakers have upon entering school could not avoid having that linguistic knowledge play no role in the developing of a word’s identity in the mental lexicon — its spelling, pronunciation and meaning, and how those are bound together — until a theorized final stage of word learning.
**Evidence from all meta-analyses and reviews about the effects of morphological instruction show that:**

Morphological instruction brings benefits to learners in general.
The less able and youngest groups gain the most from morphological instruction.
These findings counter the claim in Ehri’s “orthographic mapping” that morphology does not play a role in the development of ‘sight words’ until the final stages.
If that were true, morphological instruction would not be developmentally appropriate with these groups.
It is not just that the evidence from the best relevant research fail to support that view of the time course of morphology for word learning — the evidence is all in the opposite direction. If that theory of the time course of morphology’s role in word learning were true, morphological instruction should actually reduce learning by taking up time away from learning associations between spellings and pronunciations. I see zero evidence supporting that claim.
And yet, researchers continue to make this claim - without explaining, or even referencing why they hold this view in contradiction to evidence from meta-analyses.

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**Rastle and Taylor (2018)**
We believe that a focus on these morphological regularities is likely to be more appropriate in the later years of primary schooling.

**Castles, Rastle, and Nation, (2018)**
...we would predict that the benefits of explicit morphological instruction are more likely to be observed somewhat later in reading development. (P. 25)
Support for this hypothesis needs evidence that **including morphology from start results in lower literacy gains compared to isolated phonics.**

**Zero evidence -- all in the opposite direction...**
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Time spent on morphological instruction does not inhibit phonological learning as is often feared. In fact, phonological learning has been found to have it’s greatest positive effect on phonological learning.

**Morphological instruction in Research**

Goodwin and Ahn (2010, 2013):
Phonological outcomes had the greatest effect sizes in both meta-analyses. Morphological awareness had the second greatest effect.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Goodwin &amp; Ahn, 2010</th>
<th>Goodwin &amp; Ahn, 2013</th>
<th>All students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phonological awareness</td>
<td>0.49</td>
<td>0.48</td>
<td></td>
</tr>
<tr>
<td>Morphological knowledge</td>
<td>0.40</td>
<td>0.44</td>
<td></td>
</tr>
<tr>
<td>Phonological recoding</td>
<td>0.54</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Decoding</td>
<td>0.23</td>
<td>0.59</td>
<td></td>
</tr>
<tr>
<td>Spelling</td>
<td>0.20</td>
<td>0.30</td>
<td></td>
</tr>
<tr>
<td>Vocabulary</td>
<td>0.40</td>
<td>0.34</td>
<td></td>
</tr>
<tr>
<td>Fluency</td>
<td>-0.28</td>
<td>-0.05</td>
<td></td>
</tr>
<tr>
<td>Reading comprehension</td>
<td>0.24</td>
<td>0.09</td>
<td></td>
</tr>
</tbody>
</table>

Outcomes with greatest effect sizes from morphological instruction are all phonologically based:

\[ d = 0.49, 0.48, 0.54, 0.59 \]

Outcomes with next greatest effect sizes from morphological instruction are almost all morphologically based:

\[ d = 0.40, 0.44 \]

Decoding for children with literacy difficulties is the only phonological outcome that is lower than the morphological outcomes at \( d = 0.23 \) 

“Similar to Bowers et al. (2010), results suggest that early morphological instruction may be particularly helpful perhaps because of the synergistic relationship between phonology and morphology and the larger repertoire of root [base] and affix meanings available for use. If a reciprocal relationship exists between morphological knowledge and literacy...it makes sense to jump start this knowledge from an early age” (Goodwin & Ahn, 2013, p. 23).

One meta-analysis and one review of morphological instruction since those on previous table.

Meta-analysis: Effectiveness of spelling interventions for learners with dyslexia: A meta-analysis and systematic review *Educational Psychologist* by Galuschka, Görgen, Kalmar, Haberstroh, Schmalz & Schulte-Körne (2020)

**Phonics first or morphology**

We did not find that phonics instruction is more effective than morphological interventions in the early years of formal literacy instruction or for more severe spelling deficits. According to our meta-regression analyses, it seems likely that phonics, morphological, and orthographic interventions are applicable across a wide age span. Our qualitative synthesis indicates that instruction in morphemic structure might be especially promising for children in the upper elementary and secondary grades (Abbott & Berninger, 1999). However, meta-analyses of morphological interventions demonstrated significantly larger effects for preschool and early elementary students than for older students in the upper elementary grades and high school (Goodwin & Ahn, 2010, 2013).

“Against our hypotheses, the efficacy of phonics interventions decreased with increasing severity, whereas the efficacy of orthographic and morphological interventions increased with increasing severity.” (p. 12) Note -- small data set, so not conclusive

The finding that morphology instruction was *more* effective and phonics instruction was less effective for those with greater spelling deficits is again in the opposite direction of what is predicted from orthographic mapping’s claim that morphology only plays a role in the last stages of word learning.

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From a recent review of the effect of morphological knowledge (not instruction) on reading aloud:


The following (emphasis added) is from the conclusion of this paper...

**Educational implications**

There is general consensus that systematic phonics, that is, explicit instruction of the relationship between letters and sounds, is best practice for early reading instruction in English (see Castles et al., 2018). However, as it has been recently pointed out by Bowers and Bowers (2018), English is a morphophonemic system that evolved to jointly represent units of meaning (morphemes) and phonology (phonemes). In fact, English prioritizes the consistent spelling of morphemes over the consistent spelling of phonemes. Accordingly, it has been suggested that reading instruction in English should be guided by the logic of the English writing system (Bowers & Bowers, 2017). Thus, it should be organized around morphology and phonology rather than just phonology. **Our findings support this idea.** We found that developing readers of English made extensive use of morphology in reading aloud. Furthermore, we observed that good readers were overall more sensitive to morphological structure than poor readers. Importantly, poor readers of English often exhibit phonological processing deficits, so these children might benefit even more by teaching methods that focus on optimal grain sizes of their writing system (i.e., morphemes), which would allow a more straightforward mapping between print and sound, in addition to an easy mapping between print and meaning.

Instruction about an interrelated system should reflect that interrelation. Empirical evidence from morphological instruction

Evidence suggests we should be teaching morphology in general, and especially with younger and less able students. (No evidence to avoid morphology.)

No evidence about how to teach morphology.

Counts long held hypothesis that morphology only plays a role in word learning in later stages of word learning. (e.g. Adams, 1990 & O.M.)

In line with hypothesis of SWI that we should teach interrelation of morphology and phonology from the start.

**Empirical evidence for SWI?**

✦ Very few studies, but what we have is promising.
✦ Since we know we should be teaching about morphology, we need research testing different ways to teach morphology. SWI is a hypothesis for researchers to test.
✦ Evidence that teaching morphology supports phonological learning (Goodwin & Ahn, 2010, 2013) suggests we should teach the interrelation of morphology and phonology.
✦ Matrices, word-sums, spelling-out-orthography: instructional strategies/tools for teaching interrelation of orthography, phonology and semantics to test.
Key links to deepen understanding from this presentation

Understanding the difference between explicit instruction about grapheme-phoneme correspondences in Phonics compared to how they are taught in SWI.

“isolated phonics” vs. “orthographic phonology”
Click THIS LINK to this 15 min video explaining the difference between teaching ‘isolated phonics’ and teaching about ‘orthographic phonology as is done in SWI.

Interview on SWI with Education Podcast ‘Pedagogy Non-Grata” (April 2021)

In this interview I discuss the theory, practice and research of SWI. The host was new to SWI which provided a rich opportunity to respond to the kinds of questions novices to this work typically have.

Links to listen to podcast or watch videos
I recommend the videos for clearer understanding.

- Video 1 is HERE. (1 hr, 13 min -- same as audio Part)
- Video 2 is HERE. (33 min)
- Video 3 is HERE. (35 min -- research focus)

Those interested in the research discussion can find it near the end of video 2 at the 29 minute mark at THIS LINK. That discussion continues in Video 3 (33 min).

For my most comprehensive publication on how English orthography works, how it is taught in SWI, and the place of morphology instruction and SWI in the research, see THIS LINK for my 2021 article “Structured Word Inquiry (SWI) Teaches Grapheme-Phoneme Correspondences More Explicitly Than Phonics Does: An open letter to Jennifer Buckingham and the reading research community”
A model of English orthography from Real Spelling

Guiding Principles of Structured Word Inquiry

The primary function of English spelling is to represent meaning.

The conventions by which English spelling represents meaning are so well-ordered and reliable that spelling can be investigated and understood through scientific inquiry.

Scientific inquiry is necessary to safely guide spelling instruction and understanding.

Scientific inquiry is the only means by which a learning community can safely accept or reject hypotheses about how spelling works.

Explore the Real Spelling Tool Box 2 (on-line) for a remarkable linguistic reference to study English orthography. Explore the “Morphology Album” in the archive of videos to learn more about these and many other terms and concepts. The film on “Connecting Vowel Letters” is a particularly rich way to make sense of this term that is absent most teacher resources. This newly available reference is one you can learn from for the rest of your career.
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Links & Resources

Wordworks: www.wordworkskingston.com
Free resources, images, video clips and descriptions of this instruction in action around the world.

- YouTube videos of structured word inquiry in practice.
- WordWorks Newsletter: Email us at wordworkskingston@gmail.com to receive our free Newsletter with updates, Word Detective Episodes and frequent extra resources. See a recent example here.
- Teaching How the Written Word Works (Bowers, 2009). This book builds on my 20 session intervention study (Bowers & Kirby, 2010) in Grade 4 and 5 classes. The lessons with the <sign> and <move> matrices are from that book. Email Pete to order a copy.

Real Spelling https://www.tbox2.online
This is not a spelling program or teaching approach. It a reference that explains how English spelling works.

Spellinars: Study with Real Spelling

LEX: Linguist-Educator-Exchange (LEX grapheme cards and more) This blog by Gina Cooke with resources and on-line courses for educators who trying to make sense of the linguistic structure of words.

Real Spellers: www.realspellers.org
This website by Matt Berman (Grade 4 teacher at Nueva School in Hillsborough, California) is an excellent site for resources and spelling discussions from teachers around the world.

Beyond the Word: www.wordsinbogor.blogspot.ca Lyn Anderson’s brilliant blog specializing in SWI in the early years.

Caught In the Spell of Words: See this excellent new website from Lyn Anderson and Ann Whiting. It’s brilliant.

Rebecca Loveless: www.rebeccaloveless.com Rebecca is a teacher, tutor, education consultant who is an expert in SWI in the Bay Area.

WordTorque: www.wordtorque.com Fiona Hamilton has worked with Real Spelling since 2001 as a teacher, principle and now as a consultant based in Bangkok. See WordTorque for great resources and PD on SWI.

Language InnerViews for Educators: www.languageinnerviews.com
Scott Mills excellent new website including interviews with language experts, rich SWI posts and resources for sale.

Emily O’Connor: www.advantagemathclinic.com Emily is a math and orthography expert. Her Truer Words decks and blog are wonderful.

Sue Hegland: www.learningaboutspelling.com Sue has a long history working in an Orton-Gillingham context and the IDA before encountering SWI. Her website is a rich place for educators to study orthography.

On-line Structured Word Inquiry Tools:

The Word Searcher: A key free tool for collecting words according to surface patterns so that word scientists can investigate the substructure of words. This is an invaluable tool for your spelling investigations.

Mini Matrix Maker: A basic tool for typing word sums and turning them into matrices. See a “how to video” at this link.

Sound Literacy: This app for the iPad that offers tools for investigating morphemes and graphemes with word sums and matrices. The creator, Kathy Penn revised this tool after attending a summer course with me and has studied with Real Spelling for years. Her blog is exceptional too!

Teacher Blogs with Videos, Investigations etc:

- SWI “Investigations” Resources & videos from Pete on Real Spellers
- Dan Allen’s Grade 5 Blog
- Ann Whiting’s Grade 7 Blog
- Skot Caldwell’s Grade 4/5 Blog
- Mary Beth Steven’s Grade 5 Blog

Some References


