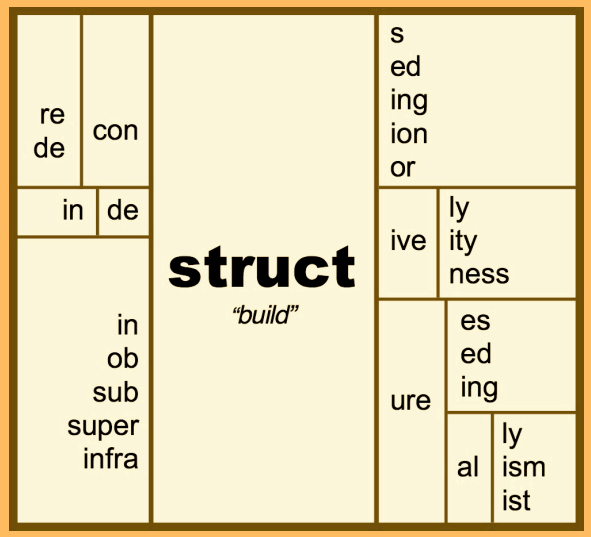
Structured Word Inquiry:

What it is, what it isn't...
and where it fits in the research

DTI's 2nd Annual Virtual Conference
April 23, 2018 - May 4, 2018



struct + ure/ + ed → **struct**ured

in + **struct** + ion → in**struct**ion

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

Notes and resources from presentation by Peter Bowers, PhD

WordWorks Literacy Centre

Note to reader,

This handout is intended as a document that is mainly useful *after* watching my talk for the 2nd annual 2018 Dyslexia Training Institute Virtual Conference. These notes, diagrams, screenshots of some of the slides in the talk, and links to related resources are offered for your consideration *after* watching the video of my talk. It is not a document intended to be coherent *absent* that context.

I've included some content that was not mentioned in the video, but that the reader might find useful after the fact. My hope is that any new information, and representations of ideas presented in my talk are more understandable with the opportunity to study this printed document in conjunction with the context the video. For those who use the video to develop their own understanding of Structured Word Inquiry, you will find many resources, websites, courses, and resources you will find linked in these pages.

Email Pete at <peterbowers1@mac.com> if you have questions.

Selected notes from talk:

Basic frame for understanding SWI…

Term "structured word inquiry" (SWI) first coined in Grade 4/5 vocabulary intervention (Bowers & Kirby, 2010)

SWI is scientific word investigation in educational contexts:

- Literacy (reading, vocabulary, spelling)
- Scientific and critical thinking skills -- understanding concepts and terms in any subject area
- Word level instruction that reflects interrelation of morphology, etymology and phonology from the beginning

Understand something by understanding what it is NOT

Just 2 common misunderstandings about SWI

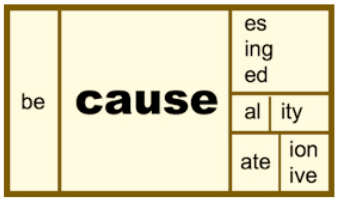
- It is NOT the same as "morphological instruction"
- It does NOT minimize the role of phonology… It demands explicit instruction about how grapheme-phonemes work from the start.

Central hypothesis / question of SWI

What if English spelling makes sense?

Scientific inquiry of orthography with reliable tools and concepts -- these include…

word sum & matrix



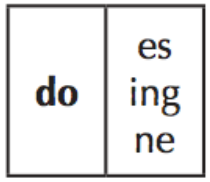
be + cause → because

cause~~e~~ + es → causes

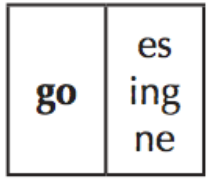
cause~~e~~ + al → causal

cause~~e~~ + ate~~e~~ + ion → causation

do + es → does
do + ing → doing
do + ne → done



go + es → goes
go + ing → going
go + ne → gone

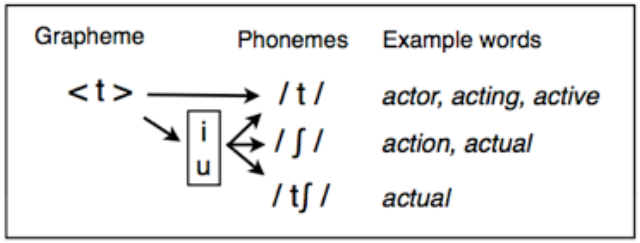


<do> and <go> matrix from Bowers, P.N., Cooke, G. (2012, Fall). Morphology and the Common Core: Building students' understanding of the Written Word. Perspectives on Language and Literacy, 31-35

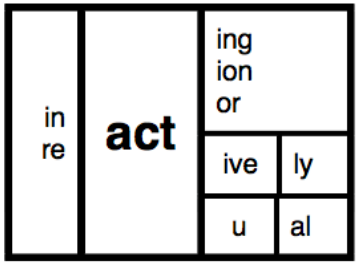
Tools for explicit instruction of grapheme-phoneme correspondences in SWI

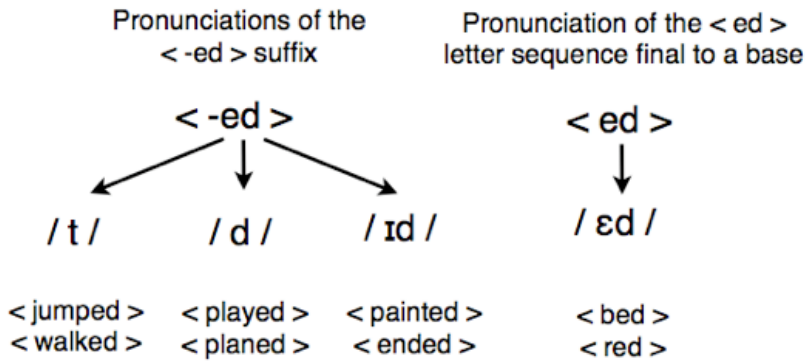
Grapheme-phoneme correspondences receive *explicit instruction* from the start. In SWI, they are taught with reference to the context of morphological families from the start of formal instruction.

Grapheme-phoneme charts are studied with conventions for showing how they interrelate with morphology.



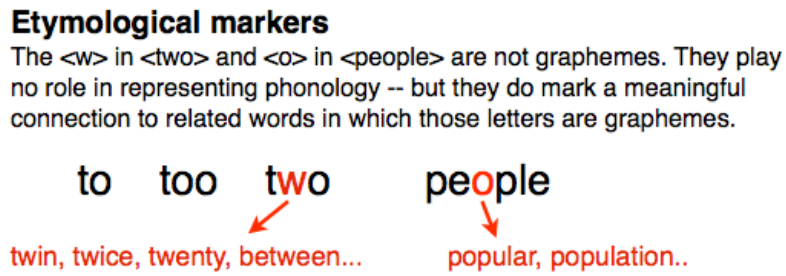
Morphological matrix for the base < act >





Etymological concepts and conventions

Synchronic etymology...



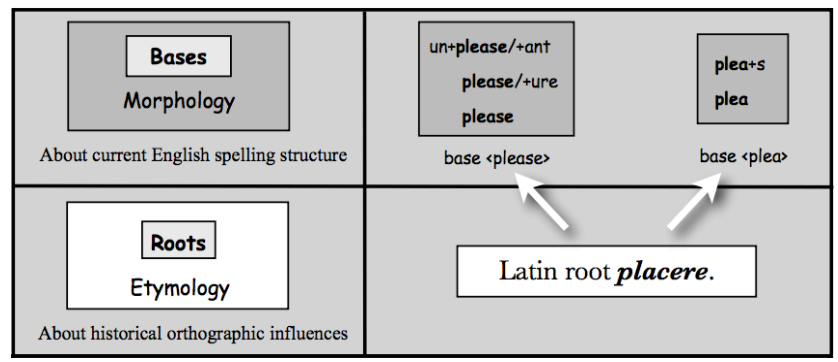
Etymological markers here can be understood as an aspect of "synchronic etymology". (Think of the structure <syn + chrone/ + ic> and the semantic force of <syn-> for "together, with" that we find in *synthesize, synapse* and *synergy* -- all words with interesting bound bases!).

Synchronic etymology is about connections in spelling and meaning between words that have evolved together at the "same time." This is *not* about words like <two> and <between> sharing a historical root that would be investigated by looking backwards *through time.*

(See commentary on synchronic etymology next about for the term "root" as used in SWI.)

The letters <w> in <two> and <o> in <people> are not graphemes representing phonemes. They are etymological markers that have evolved in these spellings to signal connections between words with related meanings. In <two>, the etymological marker <w> *also* signals a *lack* of a meaning connection to words that happen to be pronounced similarly. The use of orthographic etymological markers to distinguish homophones by marking distinct spellings is part of the "homophone principle". This principle describes the fact that if two words can be pronounced the same, wherever possible they evolve to use different spellings to signal that difference. (See Venezky, 1990).

Diachronic Etymology...



From Bowers, P. (2009). *Teaching How the Written Word Works*.

Diachronic etymology in orthography is about connections of spelling and meaning *through* time. (Think of the structure <dia + chrone/ + ic> and the semantic force of the <dia-> prefix of "through" that we see in words like *diameter* and yes, *diarrhea!*).

The <ea> digraph has evolved in the spelling <please> for a number of reasons. One is that it is available to represent the vowel phoneme in /iː/ found in the word "please" and the vowel phoneme /ɛ/ found in morphologically related words like "pleasure" or "pleasant".

The <ee> digraph cannot represent this range of pronunciations of the base <please>, so that spelling did not evolve for the spelling of the base of this morphological family. This illustrates a morphological force on the grapheme-phoneme choice of this base.

But the interrelation of morphological and phonological constraints on the spelling of this base do not represent *all* the forces at play for the evolution of the spelling <please>…

The letter sequence <plese> *could* have worked to represent the various phonological realizations of the <please> family. Why didn't that spelling evolve?

One explanation is that the spelling <plese> fails to reflect a spelling link its Latin origin -- the root *plac(ere)* for "acceptable, liked, approved". Note that the Latin stem *plac-* has the <a> but no <e>. The spelling <please> -- not *<plese> -- marks the trail back to its root origin *plac(ere).*

The <ea> digraph fits best for the phonology, morphology *and* etymology of this family. Search the letter sequence <placere> in Etymonline to find a large set of words that derived from this root -- and see how frequently a letter <a> is realized in these etymological relatives -- whether in an <ea> digraph, or as an <a> grapheme itself.

What is Structured Word Inquiry in the Research?

Structured Word Inquiry:

What it is...

- Gr. 4/5 intervention (Bowers & Kirby, 2010)

Over the course of 20 lessons, a consistent process of instruction was employed to help students develop and test hypotheses about increasingly complex orthographic patterns. The basic structure of the instruction was as follows:

1. Present an interesting spelling problem that highlights a core orthographic element, pattern or principle.
2. Present students with sets of words selected to reveal the pattern that is the focus of the lesson. Encourage the development of hypotheses for the class to test.
3. Test hypotheses in order to confirm and describe exact orthographic pattern.
4. Provide systematic practice of newly learned patterns with a set of words chosen to reinforce a given pattern. (Fig. 2 provides an example of a flow chart used to practice suffixing patterns after students had identified them through structured inquiry.)
5. Identify spelling questions in preparation for the next investigation.

Instructional activities were of three types: (a), exploratory problem-solving (hypothesis development), (b) focused problem-solving (hypothesis testing/confirmation), and (c) structured practice of newly learned content. Instructional time was divided roughly equally between activities that emphasized problem solving and those that emphasized practicing newly learned concepts.

Note the language about scientific inquiry -- developing and testing hypotheses, identifying new questions to investigate etc.

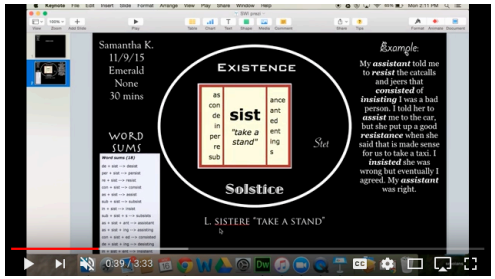
This is the description of the instruction in the intervention study (Bowers and Kirby, 2010) that introduced the term "structured word inquiry" to describe the instruction in this study.

Structured word inquiry is...

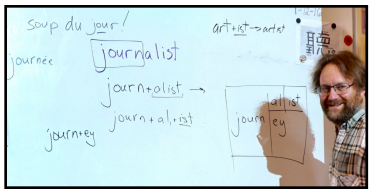
- A term from a Gr. 4/5 intervention (Bowers & Kirby, 2010).
- Scientific word investigation in educational contexts
- Reading, vocabulary, spelling instruction
- Means to deepen understanding and articulation of ideas

Student Word Study - "Dissident"

Click HERE for a video of this Grade 7 student using an investigation of the word <dissident> in a Humanities study.



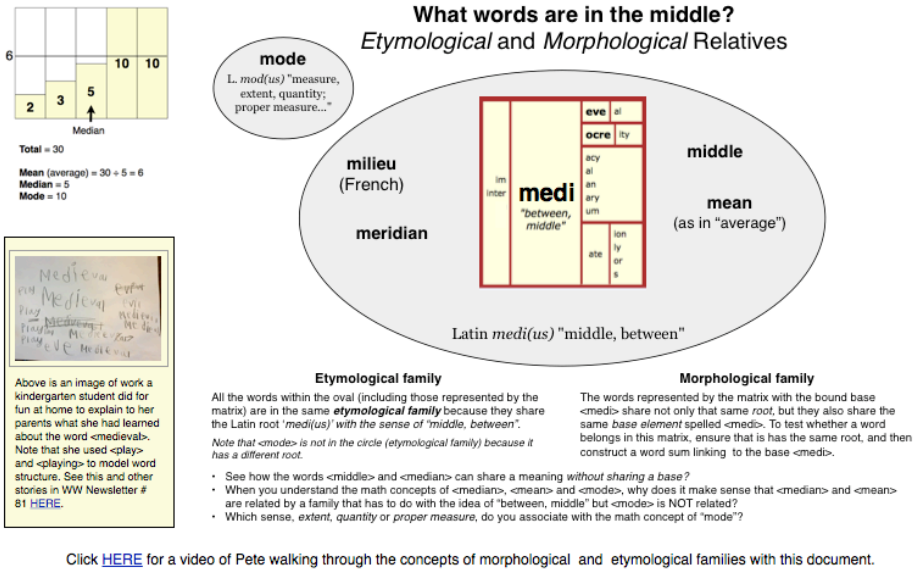
Click HERE for a video by a Grade 5 student that started with an investigation of the word <resistance> in the context of a study of the French Resistance.



Click HERE for a document about an investigation of <journal> in a grade one class who were just beginning to write in their first journals.

Click HERE for a link to *many* SWI investigations from different grades including a number that grow from the investigations that informed the image below.

This same link takes you to a pdf including the image below I address in the talk and much more.



What structured word inquiry is NOT

- It is not a "program"
- It is not "morphological instruction"
- It is not a version of whole language
- It does not ignore or underrepresent phonological factors

The place of structured word inquiry in the research

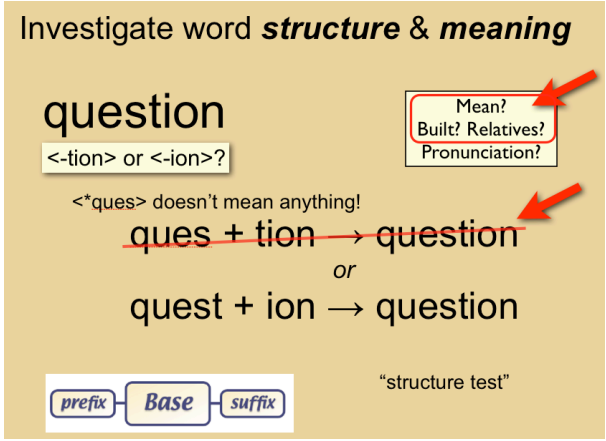
- Very early!
- Relevant to -- morphological instruction -- but not the same thing. (Instruction of interrelation of morphology, phonology and etymology)
- A response to the straight forward hypothesis that literacy instruction should reflect how our orthography system works.

Guiding scientific principles…

- Scientific inquiry seeks the deepest structures that account for the greatest number of cases -- the most elegant solution is preferred. The description that invokes the fewest entities is best.
- Scientific conclusions vs. hypotheses -- don't draw conclusions beyond the evidence. Be clear when a statement is a hypothesis, or when it is a scientific conclusion.
- Falsification -- without falsification, we are not in science.

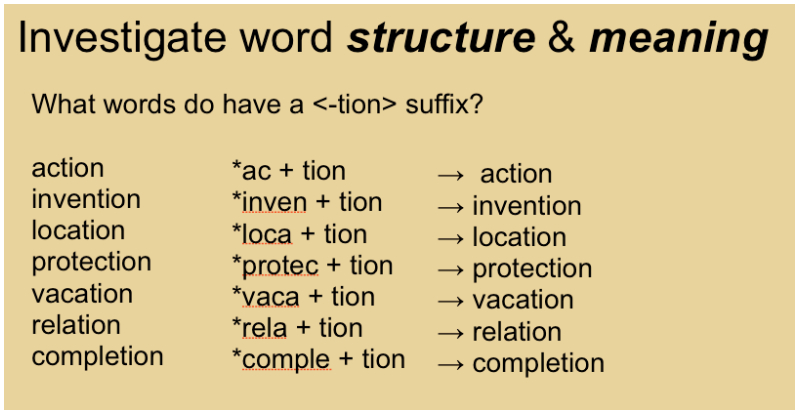
*Falsification of the so-called *<-tion> suffix*

The 4 questions (See page 18) guide an investigation about whether <question> has a <-tion> or an <-ion>.



We *reject* the hypothesis of a <-tion> suffix here because *<ques> doesn't mean anything.

But is there evidence of a *<-tion> somewhere? Here are words proposed as having this suffix by a teacher resource (first 5) and the Oxford Dictionary (last 2).



Analysis with the word sum shows that in *all* cases, these word use <-ion> suffixes.

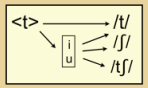
Understanding grapheme-phoneme correspondences in a morphological context.

These morphological word sums allow us to compare the pronunciation of bases or stems where the final < t > is pronounced /t/ with words where the < -ion > suffix is added to address the phonology of the < t > grapheme.

Investigate word ***structure*** & ***meaning***

What words do have a <-tion> suffix?

action	act + ion	→ action
invention	invent + ion	→ invention
location	locate/ + ion	→ location
protection	protect + ion	→ protection
vacation	vacate/ ion	→ vacation
relation	relate/ + ion	→ relation
completion	complete/ + ion	→ completion



These words are given as examples of words with a *<-tion> suffix.
Word sums *falsify this hypothesis.*

Instruction which presents <tion> as a suffix misrepresents our writing system.

- It *hinders* access to meaning connections.
- It *hinders* understanding of grapheme-phoneme correspondences.

Falsifying *<-tion> *brings clarity* to spelling & spelling-meaning connections.

Considering the Research

Keep in mind that there is VERY LITTLE direct research testing the effectiveness of structured word inquiry (SWI).

SWI is NOT equivalent to morphological instruction. SWI requires instruction about the interrelation of morphology, etymology and phonology.

However, because SWI *requires* morphological instruction, we can gain insight by considering the research about morphological instruction.

Consider some basic assumptions:

A Basic Assumption of Literacy Instruction

Learners deserve instruction that represents how their writing system works.

Becoming literate means...
"learning how to use the conventional forms of printed language to obtain meaning from words." It logically follows that...

"the child learning how to read needs to learn how his or her writing system works."

(Rayner, Foorman, Perfetti, Pesetsky, & Seidenberg, 2001, p. 34).

A Basic Assumption of Literacy Instruction

Learners deserve instruction that represents how their writing system works.

- **English is morphophonemic**
  (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

If we accept the premise that instruction should represent how the writing system works, how can we say we are meeting this goal if we don't teach the interrelation of morphology and phonology?

Note the date of this assertion by Venezky. This description of English orthography remains uncontroversial.

Historical Research Context

"Reading Wars"
Phonics & Whole Language

Great amount of research concluding:
Phonics > Whole Language

What does ***that evidence*** allow us to conclude about the effect of morphological instruction?

We cannot claim research evidence about the effect of morphological instruction based on research comparing phonics and whole language based instruction.

Unless instructional research includes groups that were taught about morphology, we have no research basis to claim to avoid morphological instruction for any group.

And yet...

Historical Research Context

Recommendations from Marilyn Adam's 1990 book, *"Beginning to Read" (cited almost 7000 times.)*

"Although teaching older readers about the roots [base morphemes] and suffixes of morphologically complex words may be a worthwhile challenge, ***teaching beginning or less skilled readers about them may be a mistake***" (p. 152).

A hypothesis — not research based conclusion.

National Reading Panel (2000)

Rayner, Foorman, Perfetti, Pesetsky, & Seidenberg (2001)

Note that neither major reviews like the National Reading Panel (2001) nor Rayner et al. (2001) addressed considering the effect of teaching about morphology.

Such reviews should highlight gaps in the research. The *hypothesis* that morphology should be avoided for younger or less able is tacitly accepted as the best evidence of the research *without any empirical evidence.*

What empirical evidence do we have regarding *including morphological instruction* from the beginning and for less able students now?

Meta-Analyses of Morphological Instruction

Authors	Findings	Journal
Reed (2008) 7 studies	• Benefits overall • Especially less able (not statistical meta-analysis).	*Learning Disabilities Research & Practice*
Bowers, Kirby & Deacon (2010) 22 studies	• Benefits overall • Largest effect for less able • Effects for Pre-School to Gr. 2 ≥ Gr. 3 -8	*Review of Educational Research*
Goodwin & Ahn (2010) 17 studies	• Significant effects for less able (studied children with learning disabilities)	*Annals of Dyslexia*
Carlisle (2010) 16 studies	• Benefits overall even with youngest students.	*Reading Research Quarterly*
Goodwin & Ahn (2013) 30 studies	• Benefits overall • Significant differences in effects for English speaking students for MA, PA, Vocab, decoding, spelling (not RC) • Larger effect sizes with younger students	*Scientific Studies of Reading*

The best evidence is the ***exact opposite*** of the long standing assumption that morphology should be avoided for younger and less able groups.

Benefits of morphological instruction were found over-all, but were ***strongest*** for less able and younger students.

If we follow the best evidence from meta-analyses, *we should be including morphological instruction from the beginning of schooling, and for struggling students.*

We have evidence that we **should** teach morphology from the start.

We DO NOT have evidence of **how best** to teach morphology.

Early direct instructional research on SWI

A study comparing SWI to Phonics in 5-7 year olds finds significant benefits for SWI in standardized reading and spelling measures

Structured Word Inquiry in Research

Devonshire, Morris, & Fluck (2013)

- 5 to 7 year-old students
- Explicit instruction of Morph., Etym., Phon. vs Phonics
- 120 students in public schools in UK
- "The novel intervention significantly improved the literacy skills of the children including both word reading and spelling compared with the phonics condition."

Rastle (in press) argued that what Devonshire et al. (2013) described as a phonics condition did not in fact constitute a fair test of phonics.

Devonshire et al. (2013) reported that the standard classroom instruction condition consisted of "traditional phonics" (p. 85). However, they also noted that the reading scheme being used was "not a phonic reading scheme; it takes more of a 'whole word' approach and children are encouraged to guess words from context or picture clues" (p. 88). Thus, while this study produced some positive evidence for morphological instruction in young children learning to read, there are questions about the nature of the standard instruction condition that would need to be addressed through further research.

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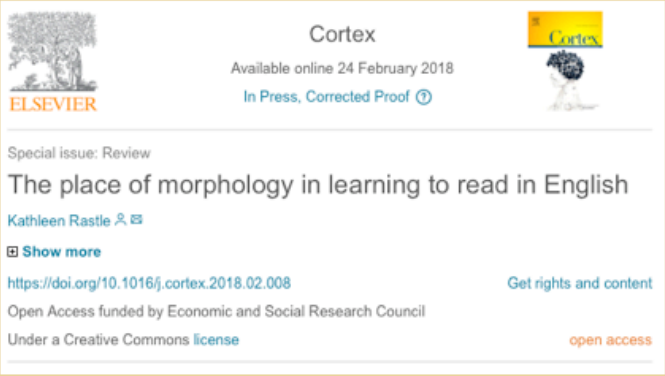
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Cortex

Available online 24 February 2018

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Special issue: Review

The place of morphology in learning to read in English

Kathleen Rastle

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I leave the reader to consider whether you agree with Rastle's assessment of Devonshire's experiment based on Devonshire's description in her paper.

See that section of the Devonshire et al next page.

At the beginning of this study the children in Year 1 had previously received one year of formal schooling (Reception Year), while those in Year 2 had received two years of formal schooling. The methods of literacy instruction in this school follow the UK National Curriculum. In their first year of school children are taught the initial 'sounds' of the alphabet, for example the /c/ sound as in <cat>, /a/ as in <apple> and so on. They begin to learn the letter names of the alphabet once this first stage is completed. During the first two years children are introduced to consonant digraphs such as /sh/ in <shop> and /ch/ in <chip>. Toward the end of Year 1 children begin to learn vowel digraphs such as /oa/ in <coat> and vowel consonant digraphs such as /ar/ and /er/. In addition, rote learning of specific word spellings is emphasised through the weekly spelling test of specific words. Children in Year 1 begin by learning a list of five consonant-vowel-consonant (CVC) words e.g., <cat>, <mat>, <hop>, <pet>. By Year 2 children have usually progressed to a list of 10 words, including high frequency words such as <the>, <and>, <one>, and words with consonant or vowel digraphs such as <they>. The children also used the Oxford Reading Tree reading scheme (Hunt & Brychta, 2008), a popular scheme in UK schools, progressing through this at their own pace. The Oxford Reading Tree is not a phonic reading scheme; it takes more of a 'whole word' approach and children are encouraged to guess words from context or picture clues. The standard practice at the school was for the children to take a new book home each week and learn to read the sentences by rote. The teacher or teaching assistant would assess whether this was achieved by listening to each child read once a week.

Above from Devonshire et al. (2013, P. 88)

My reading of Devonshire et al. differs from Rastle (in press). Rastle failed to acknowledge the detailed phonics instruction described in the study, and emphasized only the part that was presented as an *additional* aspect to the phonics condition.

Additionally, that main aspect of that condition that is was described as "not a phonics scheme" seems to have been done at home, not even during intervention time.

Given that Devonshire et al.'s results directly counter decades of assumptions in the research it is wise to be cautious about drawing too much from this one study. It is also worthwhile interrogating the nature of the phonics instruction to see how well it did and did not represent phonics practice. But it seems clear to me that the overwhelming majority of this condition was teaching standard best practice phonics. I do not see that balance represented in Rastle's criticism of this important first test of SWI vs. Phonics with young children. You can draw your own judgements from the text provided.

I also note that all phonics programs have trouble explaining the spelling of many common words. This is why every phonics program I've encountered includes some amount of time with "sight words" or "non-decodable words" that are addressed through some sort of "whole word" instruction. Thus we need to be careful about suggesting that some "whole word" instruction is evidence that an intervention cannot be considered phonics instruction.

Again, I'm presenting my own interpretation here. I leave the reader to judge the texts for themselves.

A common misunderstanding about claims for SWI in the research...

It is argued that I (and others) suggest there is strong research evidence for SWI instruction in general -- and from the start.

For example, from the same recent Rastle (in press) paper

Recently, Bowers and Bowers (2017) have put forward a strong case that the relationships between phonology, orthography, morphology and etymology should form the basis of reading instruction *from its earliest stages*. Using

Page 7 of open access version of this In Press, Corrected Proof.

Consider this argument in light of the text from the conclusion in our Bowers and Bowers (2017) paper on the next page.

Fro the first paragraph in the conclusion of Bowers & Bowers (2017).

In contrast with the vast amount of empirical research on phonics, the research on SWI is only beginning. Nevertheless, we would argue that the theoretical motivation for SWI is extremely strong (see Table 1). Furthermore, the empirical evidence is highly promising. Morphological instruction is a central feature of SWI, and the evidence from the three meta-analyses of morphological instruction (P. N. Bowers et al., 2010; Goodwin and Ahn, 2010, 2013) show that morphological instruction benefits all students, but it is particularly beneficial for less able and younger students. In addition, the three existing SWI studies report improvements in decoding (Devonshire et al., 2013), spelling (Devonshire & Fluck, 2010), and vocabulary knowledge (P. N. Bowers & Kirby, 2010), with morphological instruction directed at children as young as 5 years of age (Devonshire et al., 2013).

From Conclusion in Bowers & Bowers (2017)

From the final paragraph of our conclusion...

Although there is now growing evidence that literacy instruction should be designed to make sense of the English spelling system, little evidence is available concerning *how* to best teach these facts. Nevertheless, we are now in a position to see a promising path forward.

And perhaps most importantly, the very last sentence of the paper makes it very clear that our only claim is that there is strong evidence that we should *test* the effect of SWI compared to phonics or any other instructional approach.

Clearly more research is needed to assess the efficacy of these specific tools, and the approach more generally. Our main goal here is to help inspire more research into teaching children the logic of their spelling system (also see Crystal, 2013; Henderson, 1984; Venezky, 1999).

From Conclusion in Bowers & Bowers (2017)

I would be in complete agreement with Rastle given the following edit adding the text in red between "that" and "the"

we need to test the hypothesis that

Recently, Bowers and Bowers (2017) have put forward a strong case that the relationships between phonology, orthography, morphology and etymology should form the basis of reading instruction *from its earliest stages*. Using

Common criticisms/challenges about SWI (& morphological instruction)

- Introducing morphology may be useful, as long as it does not reduce time available for phonics instruction
- Morphology and etymology are too complicated for young children.
- Children need to get a start on the letter-sound correspondences first -- there is so much evidence that we need to teach phonology first.
- Struggling kids in particular need to learn phonology before instruction of morphology (or etymology).

These are fair questions -- but they are *empirical claims.*

In fact most of these assertions are well represented by Adam's (1990) assertion,

"Although teaching older readers about the roots [base morphemes] and suffixes of morphologically complex words may be a worthwhile challenge, teaching beginning or less skilled readers about them may be a mistake" (Adams, 1990, p. 152).

Harvard Educational Review, vol. 40 No. 2

We have little or no evidence about etymological instruction, but the evidence from meta-analyses of morphological instruction already cited is in direct contrast to Adam's hypothesis and the common assumptions listed above.

I know of zero research evidence showing that *morphology should be avoided at the beginning of instruction*. It is a hypothesis that still needs more research to confirm or reject. But so far I know of no evidence pointing to support that hypothesis, and all the relevant evidence we have points in the *opposite* direction.

Structured Word Inquiry in Research

Common assertion in the research:

Literacy instruction should begin with phonics; therefore, instruction about morphology and etymology should be introduced later.

Two scientific ways to present this assertion...

1) A hypothesis to be tested
2) A research-based conclusion with evidence to support it

Context of research evidence for this assertion?

- Comparing **A** (phonics) to **B** (whole language/less or no phonics)
- **A** > **B** not evidence about **C**
- NOR is it evidence that **C** > **A** or **B**
- It is evidence for the *need for research.*

The final sentence of our Bowers and Bowers (2017) paper emphasizes that we do have evidence *the need for research on the effect of SWI.*

Our main goal here is to help inspire more research into teaching children the logic of their spelling system

Is there a logical reason to *resist* putting resources into this line of inquiry?

What interesting lines of scientific inquiry about literacy learning and instruction might develop if we let the logical and reliable conventions of English orthography drive hypotheses to test?

Just some possibilities...

Structured Word Inquiry in Research

Some related hypotheses worth investigating

A) *Could grapheme-phoneme correspondence learning be improved by linguistic context of SWI?*

B) *If so, might such effects benefit less able and youngest most?*

Teaching grapheme-phoneme correspondences with or without morphological and etymological cues.

Consider the <ea> digraph

Isolated phonics…

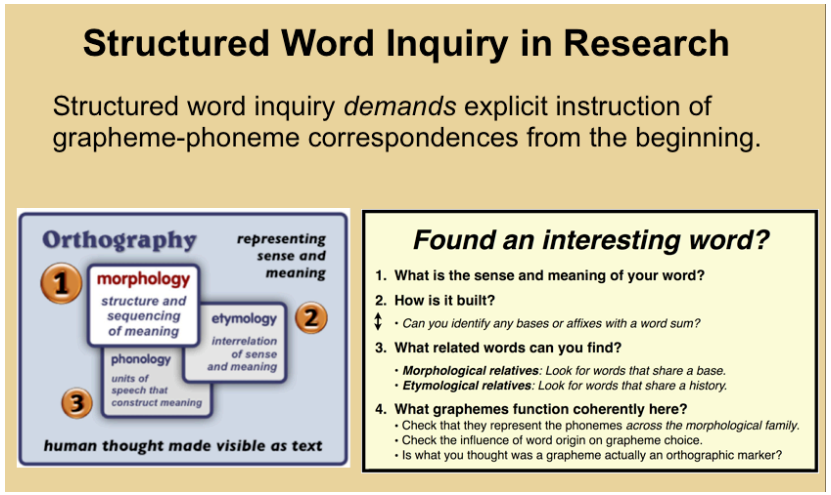
- Teach one of its pronunciations before other?
- Teach both at the same time?
- Grapheme choice treated as random.

SWI...

- Encounter <ea> in a meaningful morphological family where both pronunciations are used.
- Understand why this dual job of the <ea> can be useful.

Aside from the potential benefits of morphological knowledge gained through explicit instruction, we should also look at plausible ways morphological knowledge might support grapheme-phoneme knowledge, given our morphophonemic system.

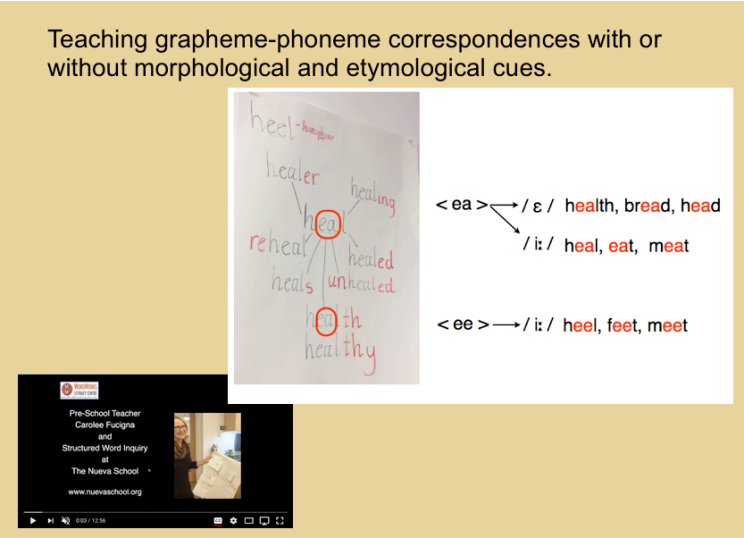
Explicit, instruction about grapheme-phoneme correspondence from the start of formal instruction is an *essential component* of structured word inquiry



See videos from a pre-school class where grapheme-phoneme correspondences are addressed in the context of studying morphological families. In these videos, Carolee Fucigna, a teacher at the Nueva School, draws on the vocabulary of her young students to help them see how the spelling of morphological and graphemic structures operate in words connected in meaning.

See the video in the next slide at THIS LINK.

The video below (click HERE) shows Carolee in her class teaching about the family of the word <rain>. Note how she takes advantage of this shorts session to highlight the the phonology of the <-s> suffix in <rains>.



Why not teach that common grapheme-phoneme correspondence of <s> for /z/ at this moment, when the children are focusing on the spelling and meaning of these related words. The <s> is *by far* the most common way to write the /z/ phoneme, so why not introduce it when it occurs. Of course, Carolee will also teach the <s> for /s/ as well.

I understand that Carolee's classroom is not typical. This is a class in a private school for gifted students.

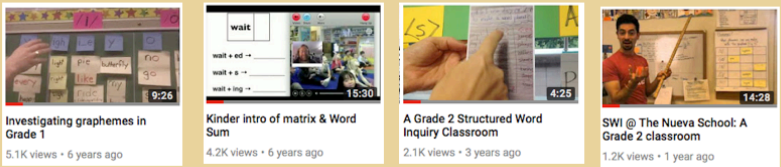
Nevertheless, observe these videos while considering what aspects of this instruction might be worth exploring in a public pre-school. Such instruction can also provide a model for public school kindergarten or Grade 1 classes. We are looking for hypotheses of early literacy instruction *to test empirically.*

Such videos, regardless of the demographics, offer ideas for this purpose.

The videos signalled in the slide below include instruction about grapheme-phoneme correspondences in K-2 classrooms can all be found at the WordWorks YouTube page HERE.

Structured Word Inquiry in Research

Structured word inquiry *demands* explicit instruction of grapheme-phoneme correspondences from the beginning.



Videos NOT presented as research evidence.

- Illustrations of possibilities of instruction that warrant research

Note!

These videos are not presented as research evidence.

They are illustrations of instructional ideas worthy of testing.

I cannot emphasize this point enough. We do have research evidence from meta-analyses that including morphology in literacy instruction was particularly effective for younger and less able students.

We have evidence that morphology *should* be included in instruction from the start.

We do NOT have evidence about how best to teach it from instructional studies.

The research world and teachers have need of ideas to test about how morphology could best be taught. These videos offer illustrations of ideas of how morphology can be taught with young children - and how that instruction can include explicit links to grapheme-phoneme correspondences in a meaningful context.

I encourage researchers to draw from examples available to then from real classrooms along with insights teachers in the trenches have to to offer based on early attempts at this kind of instruction.

These videos are not examples of research evidence with comparison groups and statistical analysis. But researchers can draw from examples like these to help them design studies to test the effectiveness of these innovations to instruction.

Theory offers good motivation to start testing SWI

Where does SWI "sit" in the research

- In absence of further evidence? Draw on theory.
  - *Default assumption: instruction should accurately represent the content being taught*
  - *Memory is better when information presented in a format that highlights the relations between items.* (Bower et al.,1969)
  - *Visual memory dramatically better when meaning can be attached to the to-be-remembered pattern* (Konkle, Brady, Alvarez, & Oliva, 2010; Wiseman & Neisser, 1974).

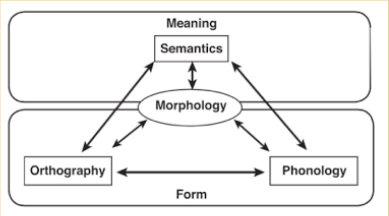
See Bowers & Bowers (2017) for more on these theories of learning and memory and how they link to SWI.

Where does SWI "sit" in the research

- In absence of further evidence? Draw on theory.

Theory in literacy research

- *Perfetti's Lexical Quality Hypothesis (2017)*
  - *orthographic, phonological, grammar (morpho-syntax), semantics, constituent binding*
- *Binding agent theory of morphological knowledge (Kirby & Bowers , 2017)*
- *Cognitive Load Theory (Schnotz, & Kürschner,2007).*



Kirby, J. R. & 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*. Amsterdam, NL: John Benjamins Publishing Company.

Two recent chapters by Kirby and Bowers (2017, in press) address our binding agent theory of morphological knowledge.

Kirby, J. R. & Bowers, P. N. (in press). The effects of morphological instruction on vocabulary learning, reading, and spelling. In R. Berthiaume, D. Daigle, & A. Desrochers (Eds.), *Issues in Morphological Processing*. Routledge.

Kirby, J. R. & 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*. Amsterdam, NL: John Benjamins Publishing Company.

More on Cognitive Load Theory and SWI

I am particularly interested in the way structured word inquiry fits so well with the recommendations of cognitive load theory. If you are interested, you can find a paper I wrote for grad school (not published!) that describes cognitive load theory and the links to SWI at THIS LINK.

Summing up

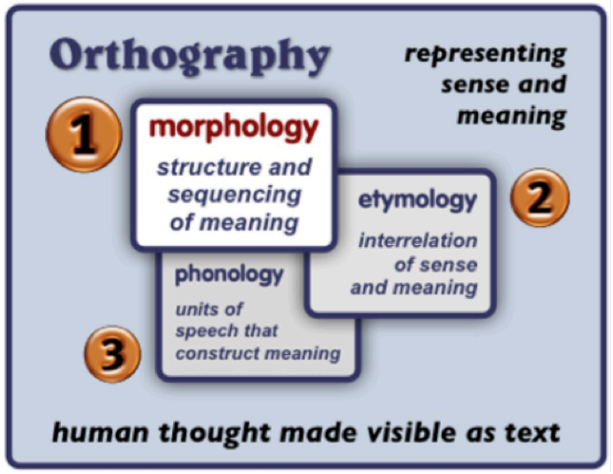
- SWI built on a simple hypothesis…

  Instruction should accurately represent the content being studied.
- Current research evidence early -- but promising.
- Long held, untested hypothesis to avoid morphological instruction with less able and younger students directly contradicted.
- Students who continue to struggle despite what is thought to be "best practice" we should explore instruction that is not just small refinements of what has not worked for those students.
- A community of educators around the world are offering a proof of concept that this is not only possible instruction from the start.

The pages included after this are simply there to offer further illustrations of how orthography works and SWI in action...

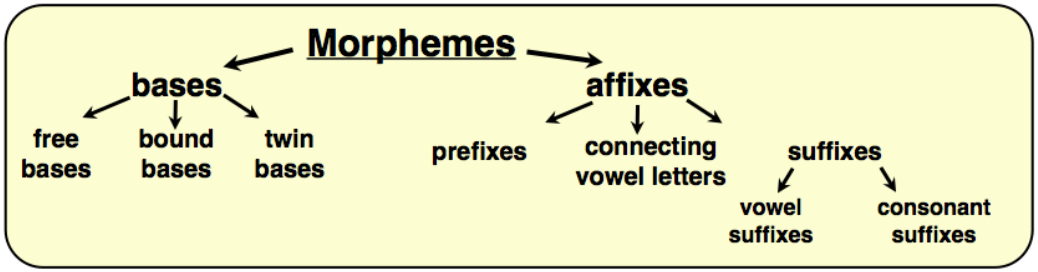
Guides and some basic terms for Structured Word Inquiry

A model of English orthography from www.realspelling.fr



Found an interesting word?

1. **What is the sense and meaning of your word?**
2. **How is it built?**
   - *Can you identify any bases or affixes with a word sum?*
3. **What related words can you find?**
   - ***Morphological relatives**: Look for words that share a base.*
   - ***Etymological relatives**: Look for words that share a history.*
4. **What graphemes function coherently here?**
   - Check that they represent the phonemes *across the morphological family*.
   - Check the influence of word origin on grapheme choice.
   - Is what you thought was a grapheme actually an orthographic marker?



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.***

Go to www.realspelling.fr to download the ***Real Spelling Gallery*** that is full of remarkable rich film tutorials. Explore the "***Morphology Album***" 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.

From the Matrix to the Word Sum

The starting point of making sense of English spelling, and thus the foundational strategy for structured word inquiry is gaining practice building word sums from matrices.

All of these matrices are taken from the 70 matrices disk from www.realspelling.fr. You can copy and paste any of those matrices to build lessons in minutes.

when **how** **what** **who**	**ever**	y	**thing** **body** **one** **where**

un dis	**ease**	y	er est ly ness
		es ing ed	

super	**star**	s ing ed y less	
		dom let	
		dust **light** **struck** **fish**	
		gaze	ing

fright	ful	ly ness	
	en	s ed	
		ing	ly
	s		

un re	**do**	ing er ne able	
		es	**n't**
		n't	

mis dis ab un re	**use**	ful less	ly ness
		es ing ed er age able ive	
		u	al ly

un non **door** **back** **show**	**stop**	s ing ed able	
		er	s
		age	es
		gap **over** **watch**	

Rules for reading a word matrix:

- Read a matrix from left to right.
- Make only single, complete words from a matrix.
- Only build words you can use in a sentence.
- You don't have to take an element from every column of a matrix – BUT...
- You must not 'leapfrog' over a column.
- WATCH THE JOINS! Sometimes changes happen where you add a suffix.

Some Challenges

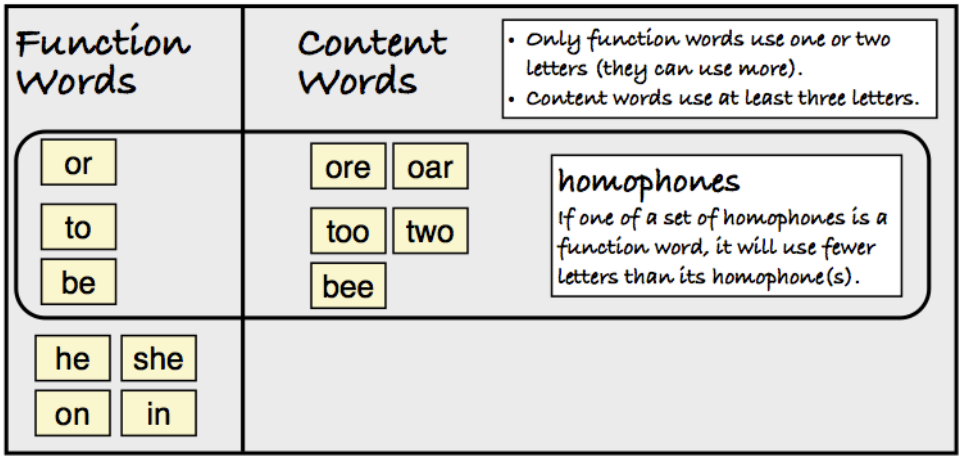
Write your word sums that come from these matrices on a separate page. Investigate the matrices to build word sums that...

- Produce compound words.
- Show each of the suffixing changes.
- Force a change in the pronunciation of the base.
- That produce complex words that have 'long vowel sounds'.

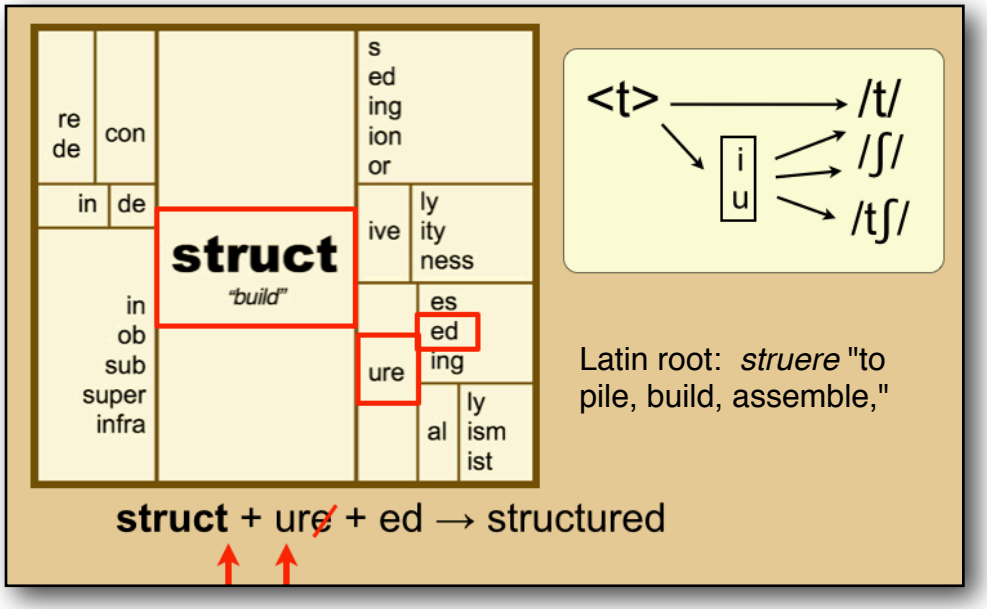
ne	o		al	ly ity
un in ante pre peri post	**nate** *"come into being, be born"*		ion	al	ly ity
		ure	al	ly
				ist	ic
				ize *or* ise	es ed ing
					ate	ion
		ive	s ity	

Some Questions

- Can you find a base with a digraph that can represent more then one phoneme?
- What base uses a trigraph?
- What base uses a <t> to represent /t/ in one derivation, but /ʃ/ in another derivation (the same phoneme commonly associated with the <sh> digraph).
- What questions challenges could you give your class from these matrices?

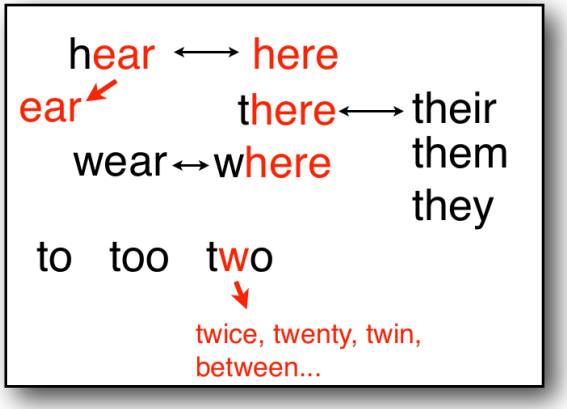


Find a tutorial film on function and content words and additional resources on this topic here.



The spellings below illustrate synchronic etymological spelling cues in many "high frequency words". We see evidence of the homophone principle -- that wherever possible -- words that can be pronounced the same will be spelled differently to signal that difference in meaning. They also show how spellings connected in meaning often evolve to have connections in spelling which mark those meaning connections.

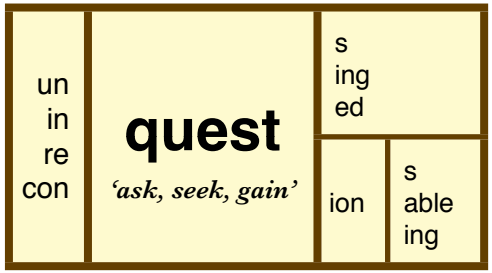
See the Real Spelling Tutorial film on "The Homophone Principle" from your downloaded Real Spelling Gallery.



The slide at left illustrates the structure of a morphological family as revealed by a matrix and word sums and how that structure interrelates with phonology. Note the varied pronunciation of the base <struct> depending on the word and how the pronunciation shift of the <t> grapheme is shown with the grapheme chart. We also see that all of the words in this family share the Latin Root *struere* for "to build". Not only does working with matrices and word sums help us make sense of the morphology and meaning of words -- it helps us understand the grapheme-phoneme correspondences.

The word matrix

(www.realspelling.com)



*The **word matrix** marks the only feature of an orthographic morphological family that is stable - the underlying orthographic representation of its morphemes. These representations correspond to what Carol Chomsky (1970) called "lexical spellings."*

The pronunciation and connotation of a morpheme can vary across members of a family. The lexical spelling of a morpheme -- that is captured by word sums and matrices -- remains stable.

The morphological matrix is a map of the interrelation of *structure* and *meaning* of written word families

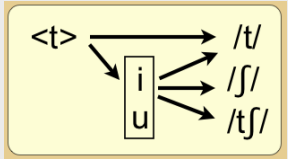
The word matrix represents members of an orthographic morphological word family. Such word families share a connection in *both* **structure** and **meaning**. (Real Selling tutorial films on morphology here.)

- *structure*: common underlying spelling of the base
- *meaning*: common ultimate etymological origin of the base

Inclusion of a word in a matrix is tested with a word sum. The word sum isolates the constituent morphemes (bases and affixes) on one side of the rewrite arrow (marking all morphological suffixing conventions) and on the other, the realized surface structure of the word.

An "echo" of the denotation of the root meaning of the base of any word represented by a matrix can be detected in the connotation of that realized word. The denotation of the root meaning of a word is checked with an etymological reference (e.g. etymonline.com).

Interrelation of graphemes and morphemes



Graphemes comprised of single letters or 2- or 3-letter teams that represent a phoneme. They occur within morphemes.

Possible phonological representations of a grapheme are signaled by circumstances.

The diagram above shows three of the possible phonological representations of the <t> grapheme. Two of these are realized in the words of the <quest> matrix shown on this page.

Note that since the <o> and the <e> graphemes in <does> are not in the same morpheme, there is no <oe> digraph in this word.

base spelled	base pronounced	Word Sums (examples listed by pronunciation of base)		
<quest>	/kwɛstʃ/	*quest* + *ion* → question	*quest* + *ion* + *able* → questionable	
	/kwɛst/	in + quest → inquest	con + quest → conquest	re + quest + ed → requested

matrix	base spelled	base pronounced	Word Sums (examples listed by pronunciation of base)	
do: ing, es, ne	<do>	/du:/	do + ing → doing	
		/dʌ/	do + es → does	do + ne → done

Is <does> really an irregular spelling?

Typically instruction leads children to believe that <does> is one of many irregular spellings they have to memorize. In contrast, the word <goes> is treated as regular.

See how the matrix and word sums below make sense of these spellings by providing a concrete representation of the interrelation of structure and meaning of the <do> and <go> word families.

A morphological matrix for <do> and <go>

do **go**	ing es ne

Word Sums for <do> and <go>

do + ing → doing	go + ing → going
do + es → does	go + es → goes
do + ne → done	go + ne → gone

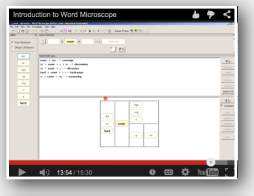
With these linguistic tools, children can be introduced to <does> as an ingenious spelling because it marks its meaning connection to its base <do> with a consistent spelling. The spelling structure of these word families is a brilliant opportunity to show children why it is useful that most letters (graphemes) can represent more than one pronunciation. Only in this way could the spelling of <do> and <does> use the same spelling of the base!

Instead of adding it to a list of irregular words, teachers who understand morphology can use the spelling of a word like <does> to introduce children to the ordered way their spelling system works.

"Teachers who consider English a chaotic and unprincipled writing system likely foster a similar view among their students. Such pupils may not look for patterns in the system because they believe that few exist to be discovered. Teachers who appreciate the writing system can help students find its patterns, fostering a positive attitude about spelling"

Treiman and Kessler (2005, p. 133)

Links to Structured Word Inquiry Videos

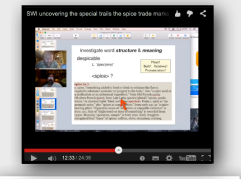


Click here for a tutorial video showing how beginners can use the Word Microscope to guide an investigation through a stud of the word <discovery>.

Click here for an inspiring video on Lyn Anderson's "Beyond the Word" Blot. It shows 5-year-old students investigating the word <carnivore> and some of its surprising relatives in Etymonline.

Click here for a video of a pre-school class investigating the morphological word family of the base <rain> with a word web.

Click here for an inspiring video / post from a Grade 5 public school with students describing their experience learning through structured word inquiry. See a WW Update on this post here.



Click here to see Etymonline author Douglas Harper discuss an investigation with Pete linking <spice> with many surprising relatives. So rich!

Click here for a Grade 7 student explaining his understanding of the political world through linguistic analysis of the word <dissent>.

- Explore a bank of videos of structured word inquiry in classrooms at this YouTube page.
- See the process of SWI investigations (inc. videos) at THIS NEW ARCHIVE.

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 www.realspelling.fr
This is not a spelling program or teaching approach. It a reference that explains how English spelling works. Find many free resources and also excellent resources and on-line courses.

LEX: Linguist-Educator-Exchange (Get LEX grapheme cards here)
This excellent 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.

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

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

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.

The Word Microscope: This software allows the user to construct matrices from word sums, search for likely members of morphological families and much more. It guides learners in their quest to make sense of English spelling. See a short user's manual and "how to video" here.

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
- Jen Munnerlyn's LIteracybytes Blog

Some References

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