WORDWORKS
LITERACY CENTRE
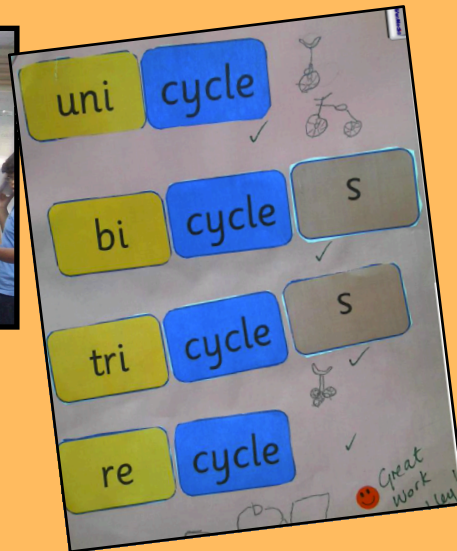www.WordWorksKingston.com

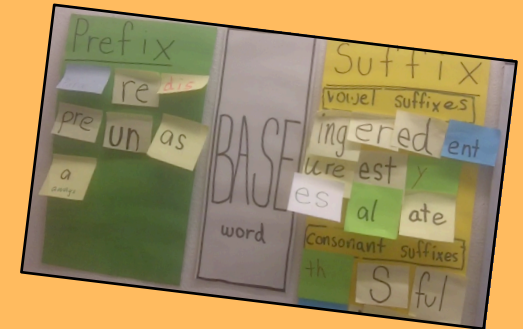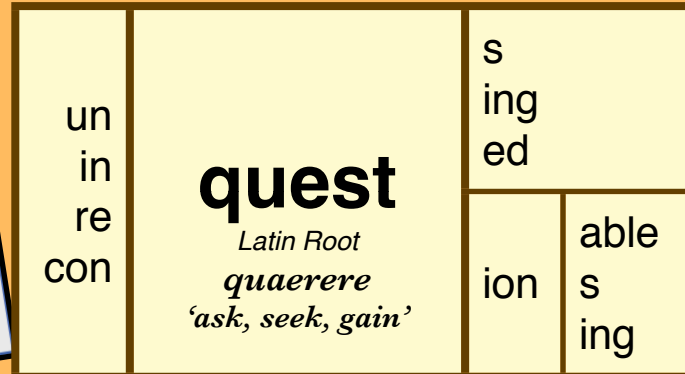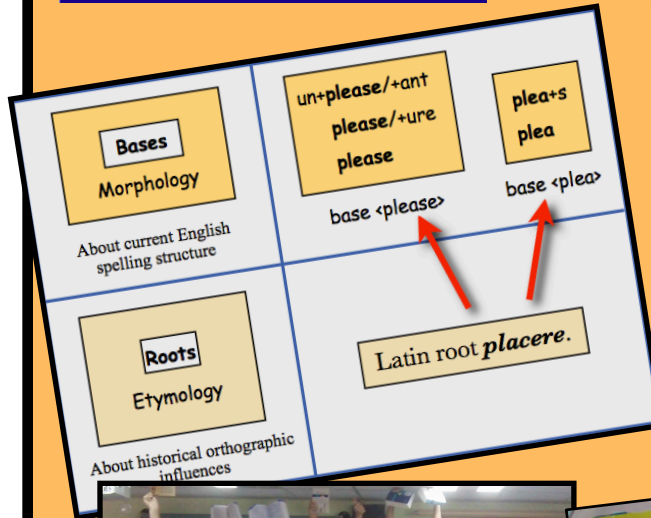Handout for Lexercise Live Broadcast 33

"Structured Word Inquiry and the Scientific Study of Words"

Presenter: Peter Bowers

Bases
Morphology
About current English spelling structure

un+please/+ant
please/+ure
please
base <please>

plea+s
plea
base <plea>

Latin root *placere*.

Roots
Etymology
About historical orthographic influences

| un in re con | **quest** *Latin Root* *quaerere* 'ask, seek, gain' | s ing ed ion | able s ing |
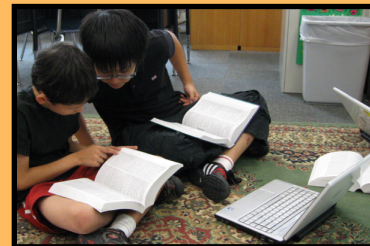
Teachers who comprehend the origins of the English language along with the primary structural patterns within words can improve their assessment skills, enhance their understanding of reading and spelling curricula, communicate clearly about specific features of language, and effectively teach useful strategies to their students."
Marcia Henry, (2010, p. 39)
"Unlocking Literacy: Effective Decoding & Spelling Instruction"

uni cycle
bi cycle s
tri cycle s
re cycle

heal
suffix
base

This hand-out was originally prepared for a presentation at the 62nd Annual Conference of the IDA in Chicago titled "Morphology: How Writing/Spelling/Orthography Take Shape" by Marcia Henry, Gina Cooke and Peter Bowers. This hand out was created to support the content in Peter Bowers' talk. That same content related directly to the content of Peter Bowers webcast with Lexercise on June 14, 2012 .

What is crazy -- the English spelling system, or our typical systems for teaching spelling?

Consider the frustration experienced by the student in this story. The teacher does the best his training allows as he tries to help his student deal with yet another "irregular" spelling. Imagine the consequences for learning when such experiences are repeated over and over.

"Know More Explosions"

Excerpt from a Grade 4 teacher's email

My program is for junior students identified with behaviour problems, problems which make their full-time participation in "standard" classrooms problematic for everyone involved. Most of our students have ADHD identifications, often coincident with LDs and other difficulties, and virtually all of them read more than two grade levels lower than they should. In many instances, the students' behaviour difficulties and their language deficits pose a chicken-and-egg question.

In a guided reading session I was doing with a burly and eager Grade 4 student reading at PM 9, the student pointed to the work "know" and asked what it said. Knowing my students, I prepared him for my answer with "OK, this is going to blow your mind, but . . . ." When I finished with "It says /no/," he didn't miss a beat. He tore the book off the table and flung it across the room. And then he started: "It does not f*#!ing say 'no!' " – giving the whole class a language lesson as he tore a path toward the classroom door – "<k> says /k/ and <w> says /w/, so it does not say f*#!ing 'no' !" How am I supposed to learn this sh*!t when the rules change? <K> f*#!ing says /k/!"

After the student de-escalated – and being told that <knight> says /night/ DIDN'T help, I promised him I'd find out why that word is pronounced as it is.

Robb

Click here for lessons investigating the spelling of <know> inspired by Robb's story.

Cursing our crazy spelling system seems like a natural response to Robb's story about the struggle to learn and teach reading and spelling in English. It would be *so* much easier if we just had a reliable, logical spelling system!

Ironically, it turns out that our spelling system **does** meet these exact criteria. Unfortunately this assertion seems absurd in light of the instruction most of us have received.

It is important to recognize, however, that the common assumption of English spelling as an unreliable, exception-riddled system is a hypothesis that can be tested.

The science of spelling: Scientific inquiry of the conventions of English spelling provides plenty of evidence that our spelling system is an extremely reliable and ordered system for representing the meaning of words to English speakers. (e.g. Carol Chomsky, 1970).

There is obviously much more to spelling than morphology. However, scientific analysis of English spelling makes it clear that we cannot make sense of our spelling system *without* morphological understanding.

Orthographic morphology is the conventional system by which spoken morphemes are written. Instruction can direct the attention of learners to this concrete representation of the meaning structure of words. Students can use morphological knowledge gained through instruction to define words they were not taught, but which are morphologically related to words that they were taught. (Bowers & Kirby, 2010). However, teaching morphology is not only about showing learners how bases and affixes can be used to learn new vocabulary.

Research has long emphasized the importance of letter-sound knowledge for literacy development (e.g., Rayner et al., 2001). The interrelated nature of morphology and phonology in English means that we cannot fully understand letter-sound correspondences without understanding the role of morphology.

It makes sense that learning letter-sound correspondences would be facilitated by a fuller *understanding* of how they operate. As linguist Richard Venezky pointed out long ago, "the simple fact is that the present orthography system 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).

A spelling test of spelling instruction

All of the words below have spellings that conform perfectly with the conventions of English spelling that linguists Richard Venezky, Carol Chomsky and others outlined long ago.

How many of these spellings can most teachers *explain* to children?

cries	give	business
sky	package	brother, hothouse
really	knew, new, know	putting
ball	night	stopper, proper
helpful	laughed, painted,	prints
full	used, sled,	bankruptcy
receive	been, teen	skiing
house	does	question

Teachers need to know about more than morphology to explain these spellings, but establishing the morphological structure of a word is a necessary part of that process, even for base words.

For just one example of how morphology makes sense of letter-sound correspondences, see the explanation of the spelling of <does> and related words that follows.

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 (www.realspelling.com) 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.

Guides for Structured Word Inquiry

"Big Ideas" to guide Structured Word Inquiry

Once teachers develop a basic understanding of English spelling and they begin to take on the structured inquiry approach (Bowers & Kirby, 2010), they should be able to identify how any instruction of the written word reinforces one, two or or all of the following "big ideas."

1. English spelling is a highly ordered system for representing meaning that can be investigated and understood through scientific inquiry.

2. Scientific inquiry seeks the most elegant solution -- the deepest structure that accounts for the greatest number of cases. (See this example)

3. Analysis of word structure for meaning cues can be used to deepen understanding of concepts and terms in any subject area (Science example, Humanities example & video).
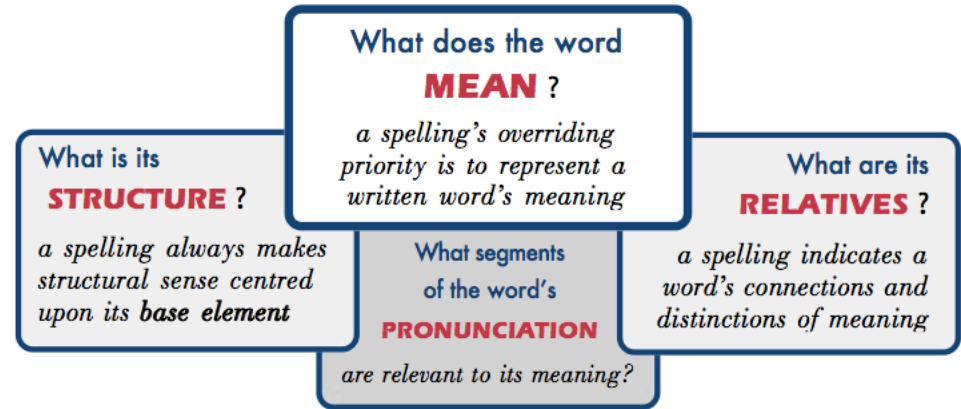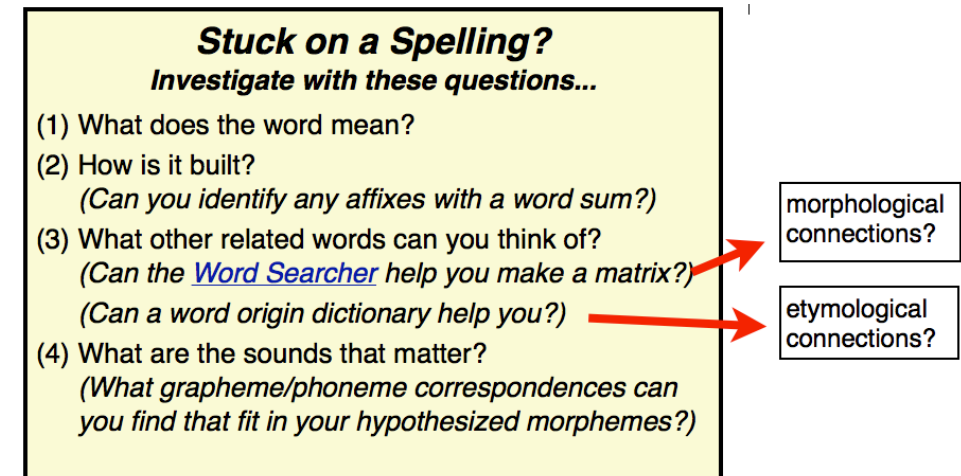

Above figure from www.realspelling.com

Process of "Structured Word Inquiry"

1) Catch learners with an interesting spelling question. (e.g., why <g> in <sign>?)

2) Strategically present a set of words that makes the relevant pattern more salient.

3) Help learners hypothesize a solution from carefully pre-sented evidence.

4) Guide testing of learners' hypotheses and identify the pre-cise pattern.

5) Practice the identified pattern with appropriate tools (e.g., word sums, flow charts).

See more on structured word inquiry, and the difference between "teacher-led inquiry" and "inquiry-led teaching" at this link.

Stuck on a Spelling?
Investigate with these questions...

(1) What does the word mean?

(2) How is it built?
(Can you identify any affixes with a word sum?)

(3) What other related words can you think of?
(Can the Word Searcher help you make a matrix?) → morphological connections?
(Can a word origin dictionary help you?) → etymological connections?

(4) What are the sounds that matter?
(What grapheme/phoneme correspondences can you find that fit in your hypothesized morphemes?)

The word matrix
(www.realspelling.com)

| un in re con | **quest** *Latin Root* *quaerere* *'ask, seek, gain'* | s ing ed |
| | | ion / s able ing |

*The **word matrix** marks the only feature of an orthographic morphological family that is static - the underlying orthographic representations of its morphemes, what [Carol Chomsky (1970)](#) called "lexical spellings."*

The matrix - 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**. (See tutorial film & resource from Real Spelling [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
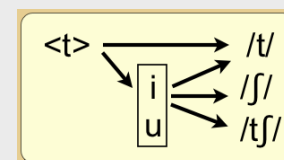
Graphemes are 1- 2- or 3-letter teams that represent a phoneme. They occur within morphemes.

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, <does> cannot use an <oe> digraph.

---

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

A Series of "Teacher-Led Inquiry" lessons sparked from the question "Why is there a <g> in <sign>?

Taken from "Teaching How the Written Word Works" (Bowers, 2009)

WordWorks Lessons© by Peter Bowers, 2007, www.wordworkskingston.com   Based on (Ramsden 2001) www.reaslspelling.com

Name_____

Activity Sheet #1

Word Building: Using a Real Spelling Word Matrix

A WORD MATRIX USUALLY ONLY SHOWS *SOME* POSSIBLE WORDS, YOU CAN USUALLY FIND MORE IF YOU TRY!

Rules for reading a word matrix:
- Read a matrix from left to right
- Make only single, complete words from a matrix
- If you are unsure that a word you build is a real word, check a dictionary
- 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

re		**sign**	al
as			ing
			ed
			ment
			ify
re	de		ate	ure

Build words with your cut out **prefixes** and **suffixes** on the **base** <*sign*>. Once you have built a word, write the **word sum** as modeled in 1 and 2.

Part A:

_____
          prefix(es)-   **base**   - suffix(es)

1) sign + al   → signal

2) as + sign + ment   → assignment

3) _____   → _____

4) _____   → _____

5) _____   → _____

6) _____   → _____

7) _____   → _____

8) _____   → _____

9) _____   → _____

10) _____   → _____

4

> **Real Spelling Tool Box Connection**
> 3E - The base elements <sci> and <sign>

WordWorks Lessons© by Peter Bowers, 2007, www.wordworkskingston.com   Based on (Ramsden 2001) www.realspelling.com

Lesson #2: Spelling Detectives

When does Suffixing Cause Changes at the Joins?

A) Investigation: Developing a hypothesis

Study the matrix for <move> and the word sums created from it to see if you can discover a consistent suffixing pattern.

Word Sums from <move> Matrix

(Draw a line through silent <e>s replaced during suffixing as shown in the second sum.)

re	**move**	s
un		ing
		ed
		er
		ment

move + s	→	moves
mov~~e~~ + ing	→	moving
move + ed	→	moved
move + er	→	mover
move + ment	→	movement
re + move + ed	→	removed
re + move + er	→	remover
un + move + ed	→	unmoved

1. What is the change that sometimes occurs at the suffix join?

2. List the suffixes that cause the change: _____ _____ _____
3. List the suffixes that cause no change: ____ _____
4. How are these suffixes different from each other?

5. Our class' hypothesis to explain how you know which suffixes *may* force a change at the join:

> **Real Spelling Tool Box Connections**
> 1K - Learning from Love (Learn about the letter <v>)
> 3A - Revisiting Suffixing (Learn many roles of the single, silent <e>)

12

Steps for constructing word sums that include marking and announcing of dropped single, silent <e>s

Step #1: Build *left side* of word sum.

This written word sum…

…is written and spelled aloud in groups like this:

please + ure →

p--l--ea--s--e-- "plus" --ure "is rewritten as"

Step #2: Say "Check the joins!" and mark changes on *left side* of word sum.

a) Note that <-ure> is a vowel suffix that replaces the final, single, silent <e> of <please>.

b) Draw a line through that silent <e> to remind yourself to announce that change when you complete the right side of the word sum.

[final, single, silent <e>]   [vowel suffix]

pleas̸e + ure →

For suffixing conventions see Big Suffix Checker and/or Interactive Suffix Checker

Step #3: Complete right side of word sum, announcing the structure you have represented on left side of word sum.

Spell and write out the result…

pleas̸e + ure → pleasure

…in groups like this:

p--l--ea--s-- "no <e>" -- "pause" -- ure

Steps for constructing a word sum that includes marking and announcing double letters

Step #1: Build *left side* of word sum.

This written word sum…

…is written and spelled aloud in groups like this:

com + mit + ee →

com-- "plus" --m-i-t-- "plus" -- "double e" -- "is rewritten as"

Step #2: Say "Check the joins!" and mark changes on *left side* of word sum.

a) Note that the <-ee> vowel suffix forces the doubling of the final single <t>. (See big suffix checker for conventions.)

b) Mark a doubled <t>.

[Mark doubled <t>]   [vowel suffix]

com + mit(t) + ee →

For suffixing conventions see Big Suffix Checker and/or Interactive Suffix Checker

Step #3: Complete right side of word sum by announcing the structure you have represented on left side of word sum.

Spell and write out the result…

com + mit(t) + ee → committee

…in groups like this:

com-- "pause" --m-i- "double t" --"pause" -- "double e"

• If the same letter occurs twice in a row within a morpheme, or if it is doubled because of a suffixing change, it is announced as a "double letter" in a word sum.

• If there is a plus sign between a letter that is repeated twice in a row it is an "accidental juxtaposition" not a double letter. There are two <m>s in <committee> but there is no "double m". There is a "double t" and a "double e".

Steps for constructing a word sum that includes marking and announcing <y> / <i> changes

Step #1: Build *left side of word sum*.

This written word sum…

ease + y + ly →

…is written and spelled aloud in groups like this:

ea-s-e-- *"plus"* --y-- *"plus"* --ly-- *"is rewritten as"*

Step #2: Say "Check the joins!" and mark changes on *left side of word sum*.

a) Note that the vowel suffix <-y> replaces the single silent <e> of <ease>.

Mark the dropped <e>

b) Note that there is no good reason to keep the <y> inside the word when adding the <-ly> suffix.

Mark the <y> / <i> change

c) Mark all the changes.

eas̸e + y̸ + ly →

Step #3: Complete *right side of word sum*, announcing the structure you have represented on the left side of the word sum.

Spell and write out the result…

eas̸e + y̸ + ly → easily

…in groups like this:

ea-s- *"no e"* -- *"pause"* -- *"change the y to i"* -- *"pause"* --ly

For suffixing conventions see Big Suffix Checker and/or Interactive Suffix Checker

- Videos of teachers and students spelling out word structure with word sums and working with matrices
- A Skype tutoring session with a Grade 2 student with word sums and the matrix.
- Go to the WordWorks YouTube page for many videos of students and teachers spelling out word sums and working with matrices.

The Orthographic Word Sum

The word sum is the basic linguistic tool for revealing the underlying structure of any word. Complete these word sums, by writing and spelling them out loud. Make sure to show any changes. Note that in the "Analytic Word Sums" the user sometimes has to identify if the starter word is a base, or if it is complex. Find more on this practice here, and a video modelling the instruction of word sums at this link.

Synthetic Word Sums

Substructure	→	Surface Structure
spring	→	spring
care + ful + ly	→	
spell + ing	→	
cute + er	→	
cut + er	→	
act + ive + ity + es	→	
marry + ing	→	
marry + es	→	
sky + dive + ing	→	
carry + age + es	→	
un + heal + th + y + ly	→	
nate + ure + al + ly	→	

Analytic Word Sums

Surface Structure	→	Substructure
alone	→	
does	→	
disease	→	
spilling	→	
duckling	→	
rightfully	→	
bookkeeper	→	
assistance	→	
sisterhood	→	
disruptive	→	

From the Matrix to the Word Sum

A foundational part of structured word inquiry is testing connections of structure and meaning by learning to building word sums from matrices.

All of these matrices are taken from the **Real Spelling 70 matrices DVD** (www.realspelling.com). This resource allows you to copy and paste any of those matrices to build lessons in minutes. With a little practice, teachers and students soon start building their own matrices.

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.
  (See the Real Spelling "Big Suffix Checker" Or Neil Ramsden's "Interactive Suffix Checker.")

Matrices

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

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

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

| | **fright** | ful / en / s | ly ness / s ed / ing ly |

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

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

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

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

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.
- Have suffixing changes.
- Force a change in the pronunciation of the base.
- Produce complex words that have 'long vowel sounds'.

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?

Investigate word meanings by investigating their spelling structure and history

Follow the traces of meaning marked by the "footprints" of spelling structure of the family of words built on the base <vestige>.

Word Matrix

in	vestige	i	al	ly
		ate	ed ing ive s	
			ion	s
			or	s y
		es		
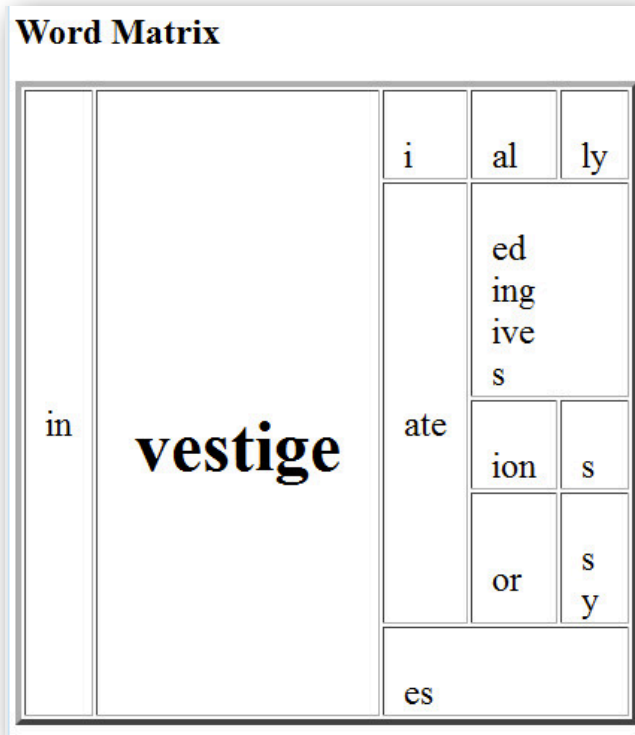
From the Oxford English Dictionary:

<vestige>:
ORIGIN early 16th cent.: from Latin *investigat- 'traced out,'* from the verb *investigare*, from *in- 'into'* + *vestigare 'track, trace out.'*

<investigate>:
ORIGIN early 16th cent.: from Latin investigat- 'traced out,' from the verb investigare, from in- 'into' + vestigare 'track, trace out.'

Learn about words from and with students

This matrix was constructed by a 12-year-old student named Thelonious and his tutor right here in San Francisco. It was produced as the result of an investigation of the word <investigate> with the help of a new tool called the Word Microscope. This image was from their post on Real Spellers. It was by reading that post that I first learned of the spelling-meaning link between <investigate> and <vestige>.

With the help of the matrix and word sums, elementary students can discover connections of meaning between words that few adults have made. This is just one piece of evidence that it is time to bring these reliable linguistic tools into English speaking classrooms everywhere.

Go here for the word sums Thelonious and his tutor created, and the discussion that grew on www.realspellers.org from this investigation. Download the Word Microscope here. (For now it only available on PC's).

Follow in the footsteps of Thelonious.
Construct word sums from this matrix.
The grapheme-phoneme diagram to the right clarifies the sift in pronunciations associated with the <g> grapheme in these words.

$$<g> \longrightarrow /g/$$
$$+ \begin{matrix} e \\ i \\ y \end{matrix} \nearrow /dʒ/$$
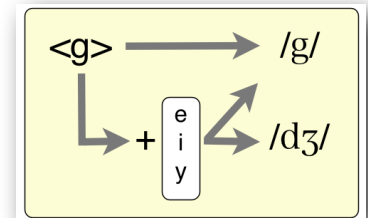
Links & Resources

Explore the links to websites and resources listed here. To access the links throughout the document, email Pete at this address: <peterbowers1@mac.com>. I will be happy to send you the pdf that contains the hot-linked text.

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

- Vides of structured word inquiry in practice:
  www.you.tube.com/user/WordWorksKingston
- **WordWorks Newsletter**: Email us at wordworkskingston@gmail.com to receive our free Newsletter with updates, Word Detective Episodes and frequent extra resources.
- **Teaching How the Written Word Works** (Bowers, 2009). This book builds on the 20 session intervention study I conducted (Bowers & Kirby, 2010) in Grade 4 and 5 classes. The lessons with the <sign> and <move> matrices are the first lessons in that book. Email wordworkskingston@gmail.com to order a copy.

The Real Spelling Tool Box 2 www.realspelling.com
This is not a spelling program or teaching approach. It a reference that explains how English spelling works. The linguistic rigour and clarity in this reference allows learners to become word scientists.

The 70 Matrix Disk: (follow links at www.realspelling.com)
An excellent starting point for teachers.

The Word Searcher: http://www.neilramsden.co.uk/spelling/
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. The above link includes a link to a free eBook to see how you might use it in the classroom.

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

LEX (Linguist-Educator-Exchange)
http://linguisteducatorexchange.wordpress.com/
An excellent blog by Gina Cooke for educators who trying to make sense of the linguistic structure of words.

LEX Grapheme Cards
A reliable reference of grapheme-phoneme cards from Gina Cooke. Email <ginacooke@sbcglobal.net> to order.

The Word Microscope:
http://www.neilramsden.co.uk/microscope/index.html

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.

Research Notes

To understand English spelling, we need to understand the interrelated nature of morphology, etymology and phonology. Morphology has been ignored or sidelined in typical classroom instruction (Nunes & Bryant, 2006). Meta-analyses show morphological instruction brings benefits in general, and in particular for less able readers (Bowers, Kirby, & Deacon, 2010; Carlisle, 2010; Goodwin & Ahn, 2010). Bowers, Kirby, and Deacon (2010) also found that morphological instruction was as effective or more in Preschool to Grade 2 as it was in Grades 3-8. The matrix and word sum provide tools teachers need to make sense of English spelling with their students.

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