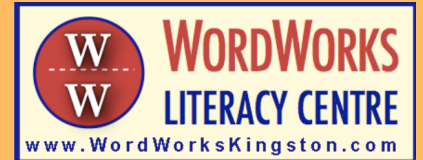


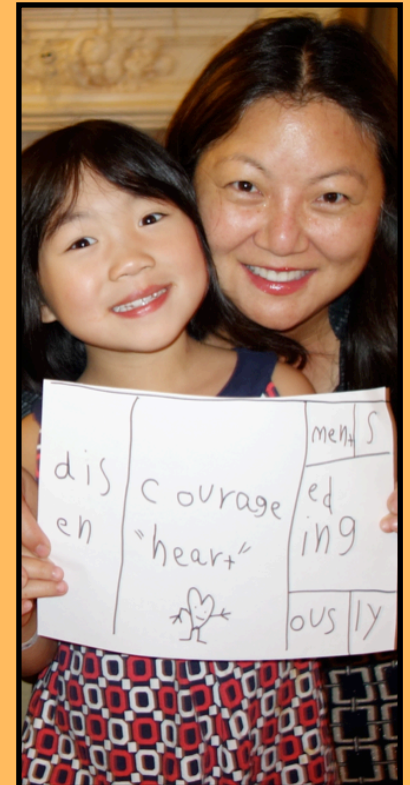
Structured Word Inquiry

(Scientific Word Investigation)



The Joy of Understanding Spelling

re de	con	struct "build"	se ding ion or	
in	de		ive ly ity ness	
in ob sub super infra			ure	es ed ing
			al	ly ism ist



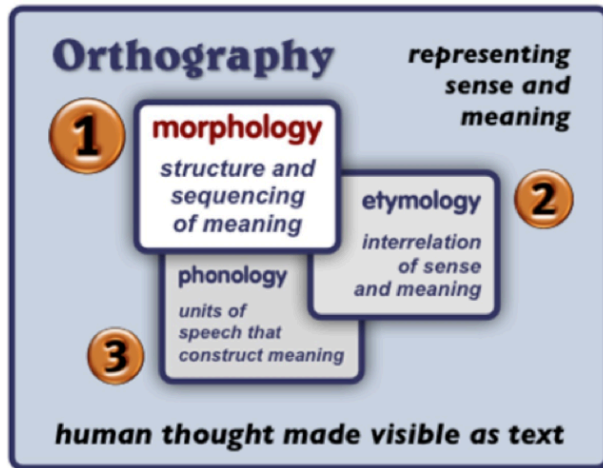
struct + ure/ + ed → **structured**
in + **struct** + ion → **instruction**

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

Peter Bowers, PhD
WordWorks Literacy Centre
Full Workshop Booklet
2024

Guides and some basic terms for Structured Word Inquiry

A model of English orthography from [Real Spelling](#)



4 Questions for *Understanding a Spelling*

Spelling is driven by the interrelationship of morphology, etymology, and phonology.

- 1. What is the sense and meaning of your word?**
- 2. How is it constructed?**
 ↑ ↓ • Identify any bases or affixes with a word sum.
- 3. What related words can you find?**
 - **Morphological Relatives:** Words that share a historical **root** and a **base**.
 - **Etymological Relatives:** Words that share a historical **root** (but not necessarily a **base**).
- 4. How are the graphemes functioning in your word?**
 - Check that they function for words across the morphological family.
 - Study how etymology accounts for the graphemes in your word.
 - Note any phonological and non-phonological functions of the graphemes in your word.

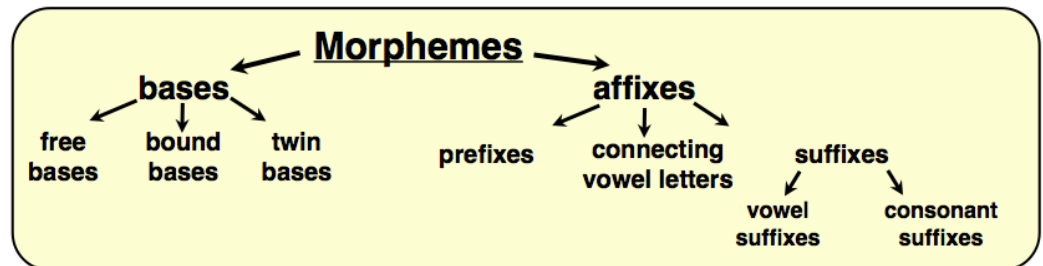
"4 Questions of SWI" Revised June, 2022
 Peter Bowers, WordWorks Literacy Centre
 (earlier versions were from 2006 to 2019)

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.*

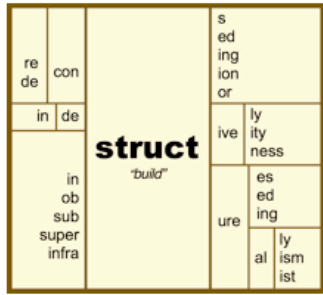
Scientific inquiry is necessary to safely guide spelling instruction and understanding.

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



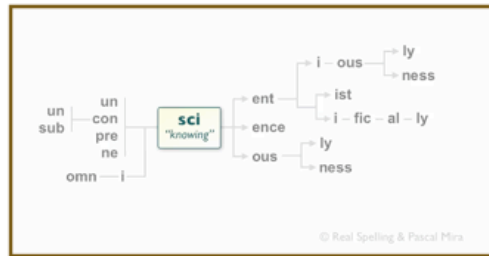
Explore the Real [Spelling Tool Box 2 \(on-line\)](#) for a remarkable linguistic reference to study English orthography. Explore the “**Morphology Album**” in the archive of videos learn more about these and many other terms and concepts. The film on “**Connecting Vowel Letters**” is a particularly 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.

Structured Word Inquiry: The joy of understanding spelling



struct + ure → **structure**
in + **struct** + ion → **instruction**

Base <struct> from
L. *stru(ere)*, *struct(us)* "build"



sc + **i** + **ent** + **i** + **fic** → **scientific**

Base <sc> from
L. *sc(ire)*, *sc(itus)* "know"

Base <fic> from
L. *fac(ere)*, "do, make"



courage (n.)

c. 1300, *corage*, "heart (as the seat of emotions)," hence "spirit, temperament, state or frame of mind," from Old French *corage* "heart, innermost feelings; temper"... from Latin *cor* "heart"



Analogy:

Immediate families like **morphological families**
kids that share parents → words that share a base element

Extended families like **etymological families**
people that share family roots → words that share historical roots

The joy that results from literacy **instruction** which **builds** understanding of word **structure** as a context for **scientific** investigation of the interrelation of **spelling** and **meaning**.

Understanding Word Families

Activity from Fiona Hamilton (www.WordTorque.com) for introducing young people to the idea that just like people come in families, words come in families too.

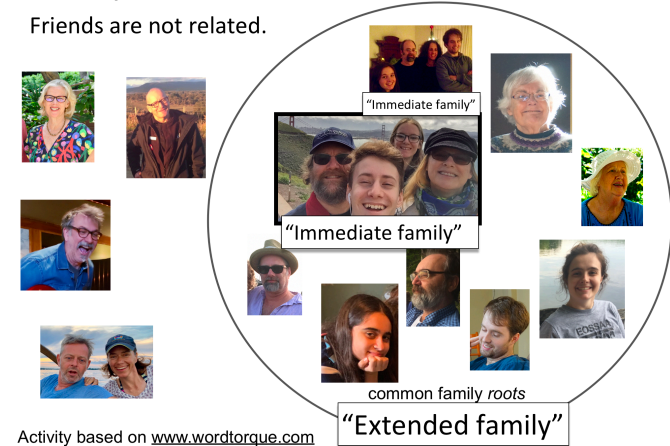
Starts with oval with Fiona's "immediate family". Outside are pictures of people -- some related (cousins, grandparents, aunts/uncles etc.). As she discusses, only those people that are *related* are placed in the oval. Friends are not related, so they are not in the "extended family."

Who is 'family' and who is a friend?



Family members are *related*.

Friends are not related.



Images inside the oval share family roots (same etymological family). Outside of oval are just friends -- not "related" -- they do not share family "roots" so they are not in the same family

Some SWI starting points...

Possible general pattern:

1) Start with a word and look for word families (morphology and/or etymology)

Use 4 questions to help guide you. Do you notice interesting morphological relatives and/or etymological relatives? What orthographic conventions can be investigated based on the word family you find?

- Suffixing changes?
- Interesting grapheme-phoneme correspondences? Digraphs or trigraphs?
- New morpheme (base or affix) to investigate?
- Change in pronunciation of grapheme explained by morphological or etymological connection?
- Look for interesting meaning connections to morphological and etymological roots that inform understanding of text and/or key concepts being studied.

Teacher chosen:

- What is the reason for your word choice?
 - Deepening content area knowledge or orthographic knowledge?
 - Targeting a big lesson, or just a quick orthographic lesson?

Student guided choice:

- Look for common spelling errors and analyze source of error to pick an orthographic convention (morphology, etymology or phonology) to investigate.
- Student Wonder Wall?
- Other?

Common strategies for brief investigations

- Spell-out-loud to identify grapheme-phoneme correspondences.
- Try a couple of word sums.
- Other?

Common strategies for larger investigations

- Collect bank of related words:
 - Word Searcher (looking for morphological relatives)
 - Etymonline -- find deepest written root and paste into search engine to get etymological relatives. Test with word sums to find which share a base.
 - With both look for useful “foils” that don’t fit, but are close.
- What do do with word banks?
 - What’s in the Family, make word web,
 - From collected words to word sums and maybe matrix.
 - Grapheme-phoneme charts?

Pete's rather lame Fox and Rabbit story for context!

Rabbit and Fox were friends, but they were very competitive. Fox was sure he could run faster, but Rabbit was convinced his hopping skills made him fastest.

Owl decided the only way to find out was a race.

Rabbit and Fox agreed. Each thought they *should* win, but just to be sure, they went shopping to find the fastest shoes they could to get ready for the race.

All the animals gathered for the big day. Being hoppers themselves, Kangaroo and Grasshopper hoped rabbit would win. Wolf and Squirrel were sure Fox would show everyone running was the way to go.

Fox and Rabbit lined up at the start line.

Owl counted, "One, two, three, HOOT!"

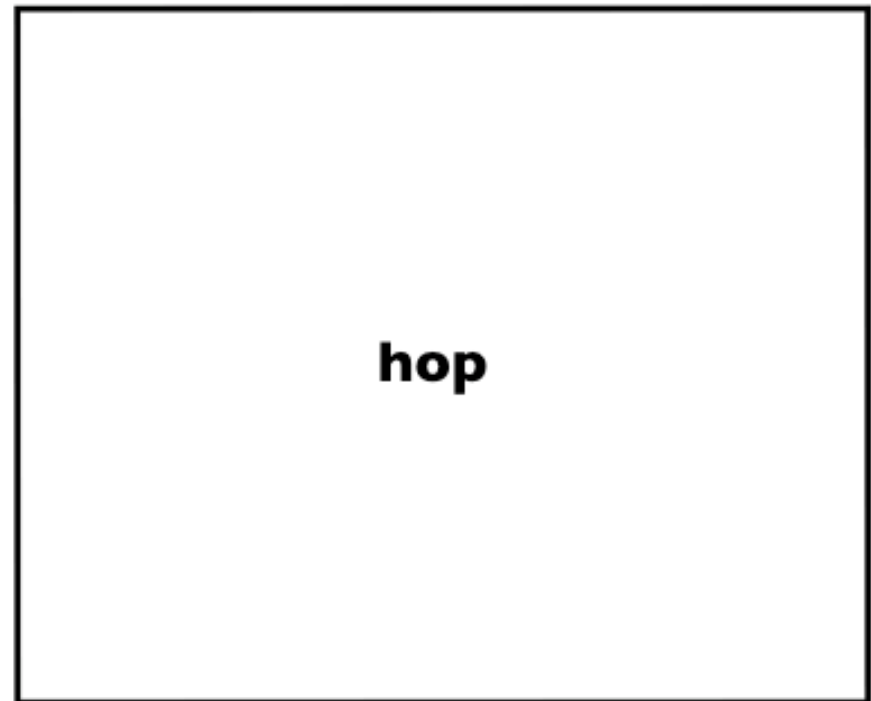
Off they went, running and hopping down the trail.

Who do you think won the day?

What Words fit in the <hop> family?

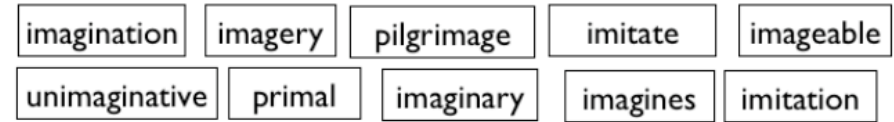
1. In the box, out of the box or on the line?
2. Show and describe evidence for your hypotheses.

hops, hopping, bounce, grasshopper, bellhop, shop, jump, choppy, hopper, hoper, hope, run, hoping



Example “word banks” for “What’s in the Family?” activities

Note that each column has most words linked by a common base element, but each **also** contains “morphological foils” that need to be tested for connections in structure (word sums) and meaning (same historical root -- etymology) to the the base that links the most words. Also note that the actual base linking the words may or may not be included in the list. That is the case in the example to the right with <imagine> in the ‘box’.



hope	busy	imagine
hopping	business	imagination
hopes	buses	imagery
hoper	bushy	pilgrimage
unhopeful	abuse	imitate
hopefully	busboy	imageable
hoped	busybody	unimaginative
hopeless	busier	primal
shop	busied	imaginary
wish	busyness	imagines
orthopedic	bustle	imitation

culture	create	science
cult	cream	omniscient
cultural	creator	scientific
cultivate	creation	conscious
difficult	creature	prescient
faculty	miscreant	scientifically
subculture	recreation	subconscious
horticulture	scream	scientist
multicultural	increase	scissors
agriculture	creatively	discipline
	creole	fascinate



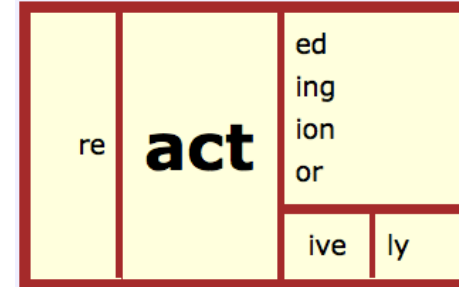
grow	do	love
grows	doing	loving
growth	undertake	loves
grower	redoing	beloved
outgrow	does	loveable
grown	dot	cherish
growl	donut	cherish
ballgown	doe	glove
row	don't	adore
crown		hug
ingrown	make	pullover
overgrowth	door	clover

hop	fish	know
hops	fisherman	known
hopping	fishes	unknown
grasshopper	fishy	knowledge
bellhop	selfish	acknowledge
hopper	wolfish	knows
hope	oafish	nose
choppy	fishcake	unbeknownst
shop	goldfish	renown
run	Dory	own
jump	trawl	knot
bounce	chum	understand

Click [HERE](#) for a document with more on this lesson and related research.

The <act> Family

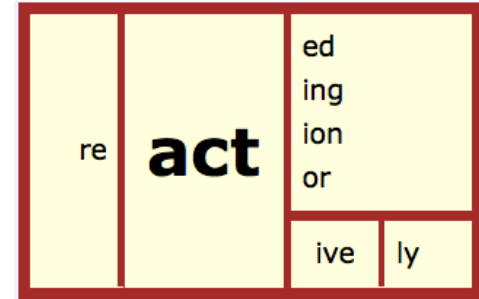
- 1) Box <act> in all the words below like in <actor>.
- 2) Write word sums with help from the matrix



Complex Word	Word Sum
actor	act + or → actor
acting	
react	
reaction	
action	
actively	
acted	

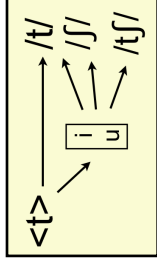
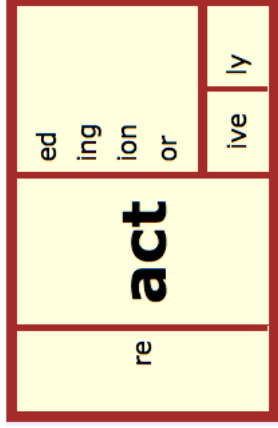
The <act> Family

- 1) Box <act> in all the words below like in <actor>.
- 2) Write word sums with help from the matrix



Complex Word	Word Sum
actor	act + or → actor
acting	act + ing → acting
react	re + act → react
reaction	re + act + ion → react
action	act + ion → action
actively	act + ive + ly → actively
acted	act + ed → acted

The <act> Family

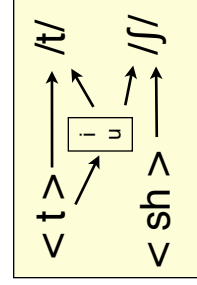
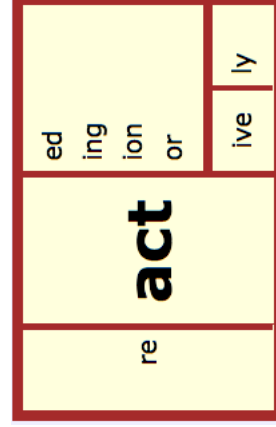


act + ion → **action** /ʃ/

act + or → actor /t/

WWW.WORDWORKSKINGSTON.COM

The <act> Family



act + ion → **action** /ʃ/

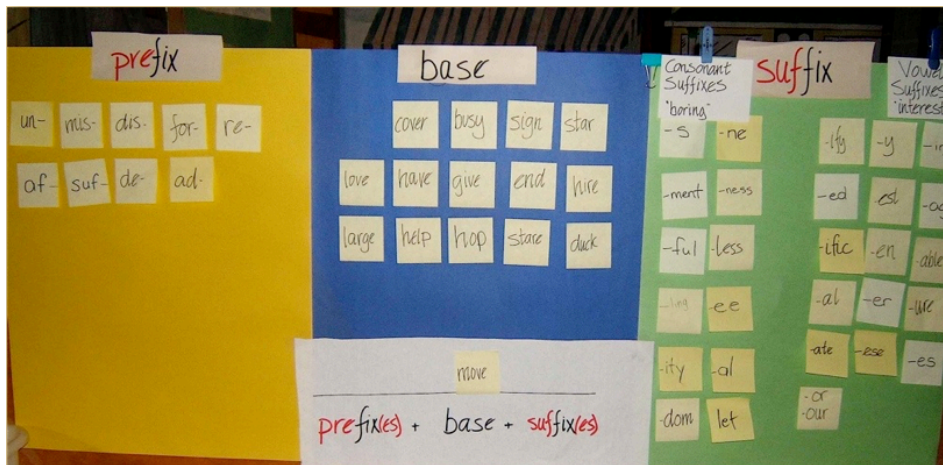
shell + s → **shells** /ʃ/

WWW.WORDWORKSKINGSTON.COM

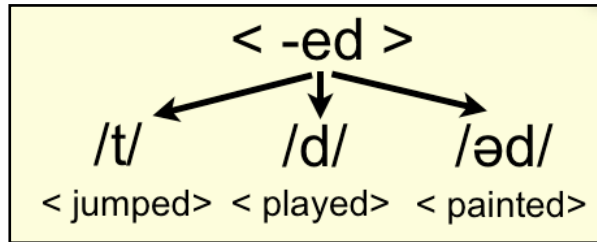
Morphemic Elements Chart				
affixes				bas ^e s
prefixes	suffixes		connecting vowel letters	free bases sign pack please heal bound bases rupt struct
	consonant suffixes	vowel suffixes		
in- re-	-s -ly -ment	-ed -ing -ion	Latin origin	
de- con-	-ness -less	-ure -ive -y	-i- -u- -e-	
un- com-		-al -es -et	Greek origin	
		-ish -ent	-o-	
		-on -ate		

Some examples of classroom morphemic element charts that you can build on. The large one at left includes all the categories I use, but I don't include all until we have a context for them. For example, the chart for "Some common affixes" may be a starting point that evolves into the bigger one at right. Notice that the small one does not separate consonant and vowel suffixes because this table was used before teaching those concepts. As new understanding grows, the bank of data we show grows. The images below are examples from classrooms in action. Sticky notes are great for showing our work evolve!

Morpheme chart			
Some common affixes			Some common bas ^e s
prefixes	suffixes		
in- re-	-ion -ed	love play paint	
de- con-	-ure -ing		
un-	-ive -ly		
	-s -y		
	-es -al		
	-ant -ful		



Name _____



help talk play record ask cloud learn float	ed
--	----

/t/	/d/	/əd/

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

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.

Click [here](#) for lessons investigating the spelling of <know> inspired by Robb's story.

Alternate investigations of the same word family.



Grade 4s investigate the structure of <knowledge>!



Circle the base <know>

Write out the word sum for each word. Spell it out-loud as you write it! Remember to announce the <kn> and <ow> digraphs, and pause at the plus signs!

- known
- knows
- knowable
- knowing
- unknown
- knowingly
- unknowingly
- knowledge
- knowledgeable

	know				

prefixes

un-

suffixes

-ing -n -s
-ly -ledge -able

Investigate the structure of <knowledge>!

1. Analyze these words with word sums according to the hypothesis that they share the base <know>. (Can you prove all the affixes?)
2. Represent analyzed words in the Matrix.

- known
- knows
- knowable
- knowing
- unknown
- knowingly
- unknowingly
- knowledge
- knowledgeable
- unbeknownst

		know			

Constructing a Matrix from Established Word Sums

In this activity, you have all of the elements provided that are needed for constructing a matrix. Use the template below to create your own “frame” for a matrix on a separate paper or white board, and then use sticky notes with the affixes in the table and word sums above to decide where those affixes can be placed on the matrix, and what horizontal and vertical lines are

needed to finish the matrix. Remember the plus sign in the matrix corresponds to vertical lines in a matrix.

AFTER you have a matrix that corresponds perfectly to the 4 word sums given, you can look for more relatives and analyze them with word sums to construct a bigger matrix.

Context for SWI Investigation:

Today’s **instruction** is on **constructing** a matrix from the building block **structures** of words called “morphemes”

Prefixes		Suffixes		
in-	re-	-ion	-ed	
de-	con-	-ure	-ing	-al
		-ive	-ly	-s

in + struct + ion → instruction
 de + struct + ive → destructive
 re + con + struct + ed → reconstructed
 struct + ure + s → structures
 struct + ure + al + ly → structurally
 de + con + struct + ion → deconstruction

Morphological relationships:

The word sums (above, right) are for words built on the base <struct>.

Etymological relationships:

All of these words derive from the Latin root *stru(ere)*, *struct(us)* for “pile, build, assemble”

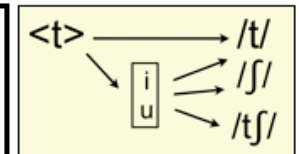
Orthographic phonology:

Note the diagram for the possible phonological associations with the <t> grapheme. It shows the circumstances in which the <t> can spell different phonemes.

See IPA symbols for the pronunciation of the <t> grapheme in the final <t> of the <struct> base:

- “structure” the <t> can be pronounced /ʃ/ or /tʃ/
- “instruction” the <t> is pronounced /ʃ/
- “destructive” the <t> is pronounced /t/

	<h1>struct</h1> <p>“build”</p>	
--	--------------------------------	--



Studying linguistic word families:

Building understanding of the interrelation of morphology, etymology and phonology from the start

What is the name of this word family?

Word Bag

playfully replay
playful player
ballplayer
playmate
playing

< p > < l > < ay >
/ p / / l / / eɪ /

/ eɪ /

- < ay > play
- < ai > plain
- < a > plane

“orthographic markers”

Letters can have jobs *other* than acting as a grapheme or part of a digraph or trigraph. Some markers can play a phonological role, others play not phonological role at all.

Final <e> in <plane>

The final, non-syllabic <e> of <plane> is not a grapheme. It a phonological marker signalling the pronunciation of the previous single vowel letter grapheme <a>.

Final <e> in <please>

The final, non-syllabic <e> of <please> is a *plural cancelling marker*. In this word it functions to prevent <please> being confused with its homophone, the plural <pleas>. The spelling of countless words like <house> and <nurse> cannot be understood without the etymological structure of the plural cancelling marker.

< ea >

- / ɛ / pleasure
- / i: / please

< s >

- / ʒ / pleasure
- / z / please

1) Which of the words in this “Word Bag” belong in the same family as <pleasure> and <displease>?
2) What is the name of that family?

Word Bag

plea ease
unpleasantly east
unpleasant pleas
plead pleasing
pleasurable peas

please/ + ing → pleasing

<please> Word Family

pleas ure able

displease pleasing
pleasure unpleasant
pleasurable unpleasantly

please/ + ure/ + able → pleasurable

prefix - Base - suffix

What kind of word family?
What kind of spelling-meaning connection?

Word Bank

happy displease
plea pleasing
placate placidly
pleasurable
placid plead
pleas
unpleasant lovely

please-

prefix - Base - suffix

Morphological family
(common base element and root)

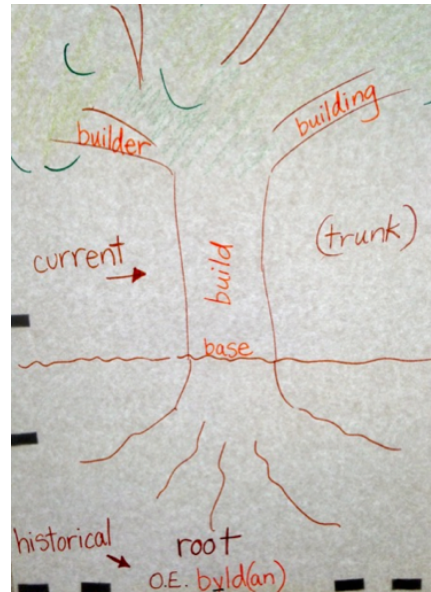
please

Etymological family
(common root)

Latin *plac(ere)* “to be acceptable, be liked, be approved”

Picturing the terms “root” (etymology) and “base” (morphology) and how they interrelate

This image from a Grade 1 class at Nueva helps remind us that when we are reading English text, we don't see “roots” of words, but we do see “bases” of words represented. We need to dig beneath the surface into the history of words in an etymological reference like Etymonline.com to see where a current English word derived from. When I draw a model of this, I often show a root popping above the ground to signal that sometimes we do happen to see roots that are actually non-English words that we use as though they are English. For example look at this entry for the word <vacuum> in Etymonline:



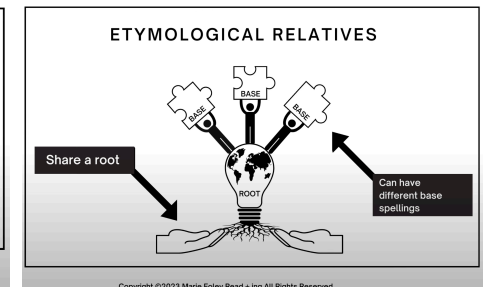
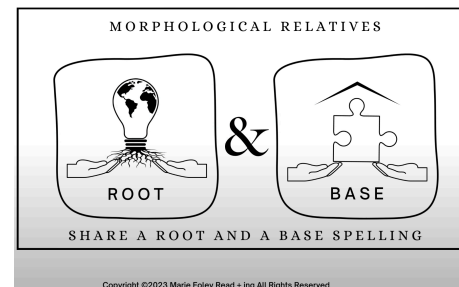
vacuum (n.)

1540s, "emptiness of space," from Latin *vacuum* "an empty space, vacant place, a void," noun use of neuter of *vacuus* "empty, unoccupied, devoid of," figuratively "free, unoccupied," related to *vacare* "be empty" (see [vain](#)).

Notice that the entry <vacuum> that we do read in English texts uses exactly the same spelling as the Latin root that is cited in italics '*vacuum*'. This means that when we use this word we are using it as a loan word from Latin. This also explains the surprising <uu> sequence. This is not an exception to the convention that “no English word uses <uu>, as this is not an English word!



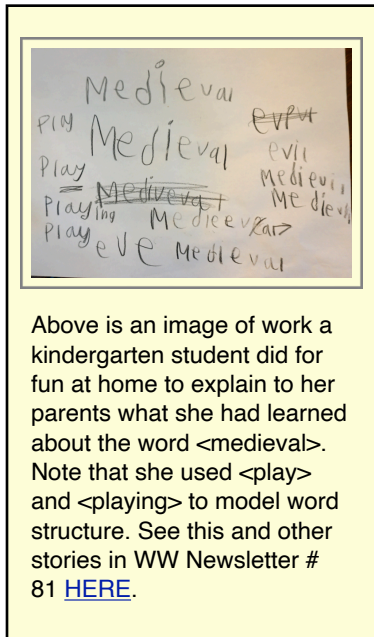
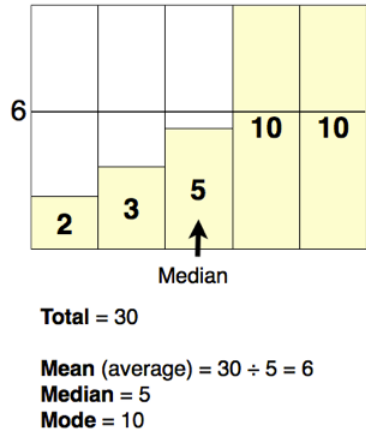
The images above and below are screen shots of [THIS NEW](#) video by Marie Foley and Pete Bowers designed to clarify how the interrelation of morphology and etymology works, and how we can use Etymonline to identify the historical roots of any word, and to use that root to find etymological relatives.



I highly recommend studying this video multiple times.

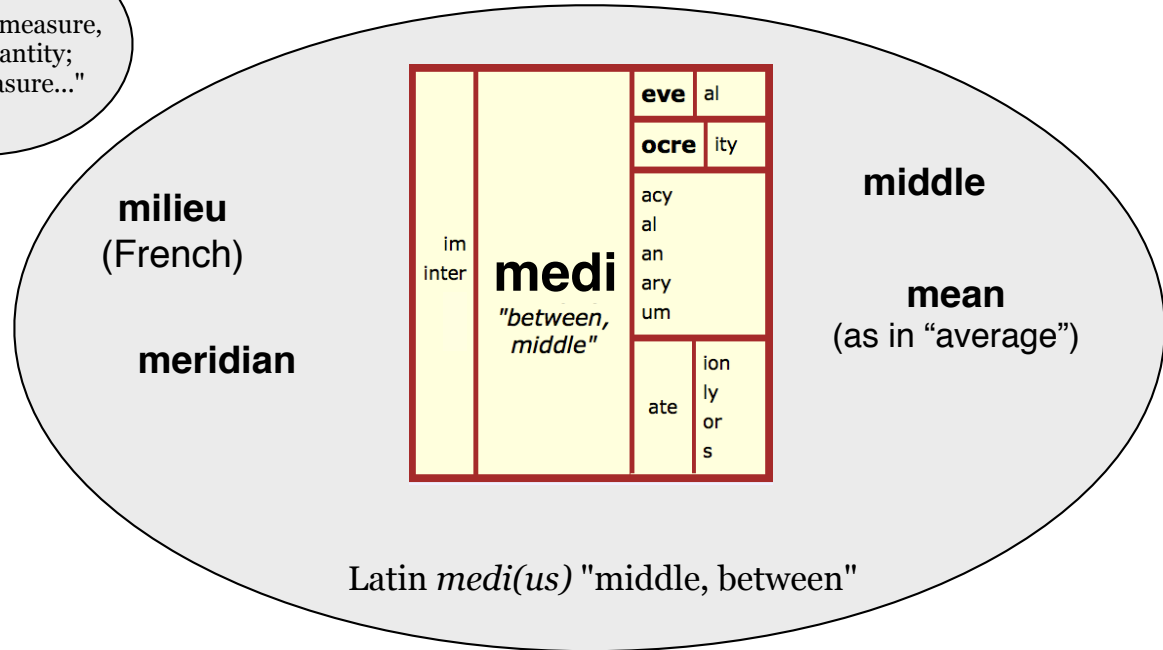
On the next page is a diagram explaining the same relationships with different words.

These concepts are essential for understanding the “structure and meaning test” (Kirby & Bowers, 2018) for scientific inquiry of morphological and etymological families that is a focus of our studies for the whole week.



What words are in the middle? Etymological and Morphological Relatives

mode
 L. *mod(us)* "measure, extent, quantity; proper measure..."



Etymological family

All the words within the oval (including those represented by the matrix) are in the same **etymological family** because they share the Latin root '*medi(us)*' with the sense of "middle, between".

Note that <mode> is not in the circle (etymological family) because it has a different root.

- See how the words <middle> and <median> can share a meaning *without sharing a base*?
- When you understand the math concepts of <median>, <mean> and <mode>, why does it make sense that <median> and <mean> are related by a family that has to do with the idea of "between, middle" but <mode> is NOT related?
- Which sense, *extent, quantity* or *proper measure*, do you associate with the math concept of "mode"?

Morphological family

The words represented by the matrix with the bound base <medi> share not only that same *root*, but they also share the same *base element* spelled <medi>. To test whether a word belongs in this matrix, ensure that it has the same root, and then construct a word sum linking to the base <medi>.

Click [HERE](#) for a video of Pete walking through the concepts of morphological and etymological families with this document.

Name _____

Activity Sheet #1

Word Building: Using a Real Spelling™ Word Matrix

A WORD MATRIX USUALLY ONLY SHOWS *SOME* POSSIBLE WORDS. YOU CAN OFTEN 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.
- 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.

re		sign	al
as			ing
			ed
			er
			ment
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) _____ → _____

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>)

This and the next page are from the initial lessons from Pete's teacher resource book [Teaching How the Written Word Works](#).

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

Lesson #2 Continued...

B) Testing our Hypothesis:

These matrices build on **base words** (a one **morpheme** word - no **prefix** or **suffix**) that end with the letter 'e'.

- Create word sums from a variety of the matrices to test our class hypothesis. (You don't need to build every possible word from each matrix to test the hypothesis.)
- Be ready to share interesting discoveries with the class. Any surprising findings, or words whose pronunciation changes when you add affixes?

dis	please	es ed ant ure
-----	---------------	------------------------

un	hope	s ing ed ful less
----	-------------	-------------------------------

dis	agree	ing ed ment able
-----	--------------	---------------------------

re	take	s ing en
		out

mis	be	have	s ing ed
			i our (Can) or (US)

en	large	es er ing ed ly ish
		ment s

be	ing en
-----------	-----------

Real Spelling Tool Box Connections

1D - The effect of suffixes on a single, silent <e>
 1B - Making plurals - 1- whether to use <-es> or just <-s>
 3G - The end of base words <dge> or just <ge>? the suffix <-age> (understanding the silent <e> in <large>
 1G - 'long' and 'short' vowels and the single, silent <e>
 1I - Homophones - 1- (Make sense of the silent <e> in <please>
 1H - Compound words - 1- (Does <takeaway> break suffixing conventions?)

15

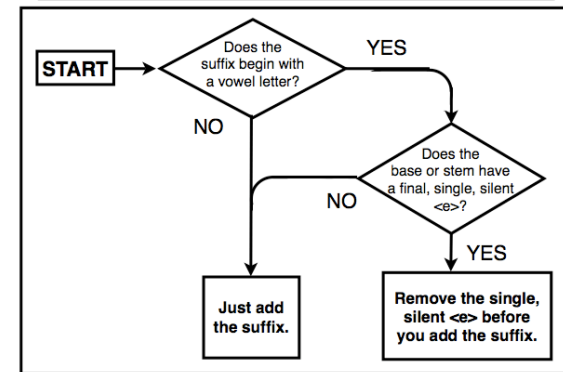
WordWorks Lessons© by Peter Bowers, 2007, www.wordworkskingston.com Based on (Ramsden 2001) www.realspelling.com

Activity #3

Flow Chart for Dropping the Single, Silent <e> During Suffixing

Instructions:

- On a separate page, rewrite the beginning of the word sum provided.
- Use the flow chart to identify the correct spelling when fixing the suffix to the base.
- When a silent <e> is replaced by a vowel suffix, cross it out on the left or the "rewrite arrow" before competing the spelling on the left side of the arrow.



Example: date + ing → dating

Word Sums

- | | |
|---------------------|---------------------|
| 1. cave + ed → | 11. laze + y → |
| 2. create + or → | 12. rule + er → |
| 3. require + ment → | 13. imagine + ary → |
| 4. smile + ing → | 14. pure + ly → |
| 5. rude + ly → | 15. please + ure → |
| 6. brave + est → | 16. operate + ion → |
| 7. brave + ly → | 17. smile + s → |
| 8. include + ing → | 18. amaze + es → |
| 9. lone + ly → | 19. amaze + ment → |
| 10. close + ness → | 20. ice + y → |

Real Spelling Tool Box Connections

3A - Revisiting suffixing (Is <-y> a vowel suffix?)

18

Spelling Out & Writing Out Word Structure

Do these activities with guidance of this booklet on “Spelling-out Word Structure” (click [here](#)). Explore [this document](#) for more on spelling out word structure.

Synthetic word sums:

1. Mark suffixing changes on left.
(See tools for suffixing conventions [here](#) and [here](#).)
2. Spell out and write out your word structure hypothesis on the right side of the re-write arrow following the conventions in the “Constructing Word Sums Booklet”.

Analytic word sums:

1. Spell out your hypothesis of the structure of the given word *without* the scaffolding of a completed word sum with a partner.
2. Test your hypothesis (or hypotheses) by writing out the substructure on the right of the word sum.

Note: To spell out the word structure in the “Analytic Word Sums”, you need to identify whether the starter word is a base, or if it is complex.

Synthetic Word Sums

Substructure	→	Surface Structure
spring	→	spring
care + ful + ly	→	carefully
spell + ing	→	
cute + er	→	
cut + er	→	
act + ive + ity + es	→	
busy + ness	→	
busy + body	→	
graph + eme + ic	→	
phone + o + log + y	→	
un + heal + th + y + ly	→	
nate + ure + al + ly	→	

Analytic Word Sums

Surface Structure	→	Substructure
reach	→	
react	→	
does	→	
pliers	→	
duckling	→	
spilling	→	
rightfully	→	
logically	→	
disruptive	→	
assistance	→	
sisterhood	→	
bookkeeper	→	

Videos of teachers and students spelling out word structure with word sums and working with matrices

- The word sum is the basic linguistic tool for analysis of morphological word structure. See Real Spelling tutorial films on this topic and so much more [here](#).
- Visit the [WordWorks YouTube page](#) for many videos illustrating and integrating spelling-out word structure into everyday instructional practice.
- See a [Skype tutoring session](#) with a Grade 2 student using spelling out of word structure with word sums and the matrix.

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 DVD. You can copy and paste any of those matrices to build lessons in minutes.

when	ever	y	thing
how			body
what			one
who			where

un	ease	y	er
dis		es	ty
		ness	
		es	ing
			ed

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

fright	ful	ly
	ness	
	s	ed
	en	ing
		ly
		s

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

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

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

ne	o	nate	al	ly
un	in		ity	
			ion	al
			ity	
ante		ly		
pre		ist	ic	
peri		ure	al	
post		ize	es	
		or	ed	
		ise	ing	
		ate	ion	
		ive	s	
			ity	

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'.

Some Questions

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

Function Words	Content Words
<ul style="list-style-type: none"> or to be he she on in 	<ul style="list-style-type: none"> ore oar too two bee

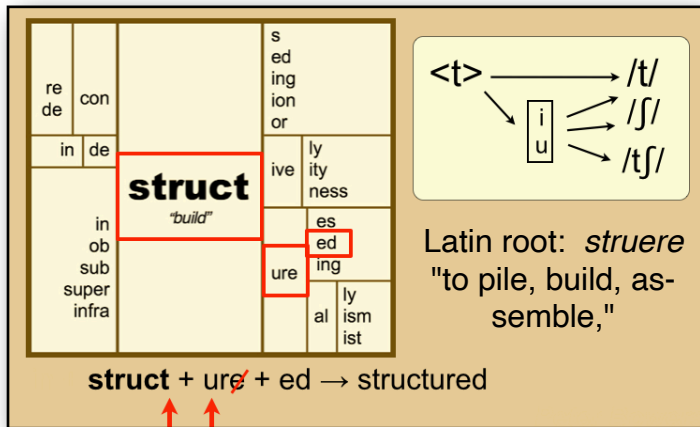
• Only function words use one or two letters (they can use more).
 • Content words use at least three letters.

homophones
 If one of a set of homophones is a function word, it will use fewer letters than its homophone(s).



Find a tutorial film on function and content words and additional resources on this topic [here](#).

Synchronic etymology: The words above illustrate two ways spelling has evolved to mark meaning with spelling. They are spellings that evolved *at the same time* (synchronic) to (1) mark connected meanings with connected spellings or (2) distinguish words with no meaning connection but the same pronunciation with different spellings -- “the homophone principle”.



Orthographic etymology: diachronic and synchronic influences on spelling
 See examples of synchronic etymology above and an example of diachronic etymology described below.

Learn more about etymology and how it helps understand the spellings of the words from the examples below from the tutorial films in the “Orthographic Etymology” folder in the [Real Spelling Gallery](#). Gina Cooke’s [LEX resources](#) and [LEXinars](#) are another rich source for understanding orthographic etymology.

Morphology, etymology and phonology: The slide immediately above and left illustrates the structure of a morphological family as revealed by a matrix and word sums. It also shows how that structure interrelates with phonology. Note the varied pronunciation of the base <struct> depending on the word. The pronunciation shift of the <t> grapheme is shown with the grapheme chart. 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. All of words in the <struct> family derive from the Latin Root *stru(ere)* for “to build”. *Diachronic etymology* marks connections of meaning and spelling *across time* (diachronic) back to an etymological origin (root).

The word matrix

(www.realspelling.com)

un in re co n	quest 'ask, seek, gain'	s	
		ing	
		ed	
		ion	s able ing

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

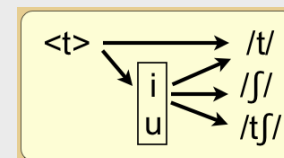
The word matrix represents members of an orthographic morphological word family. Such word families share a connection in *both* **structure** and **meaning**. (Real Selling tutorial films on morphology [here](#).)

- **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/

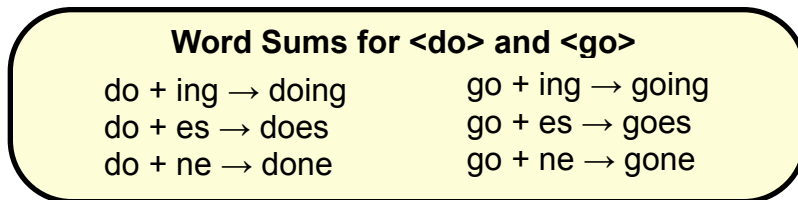
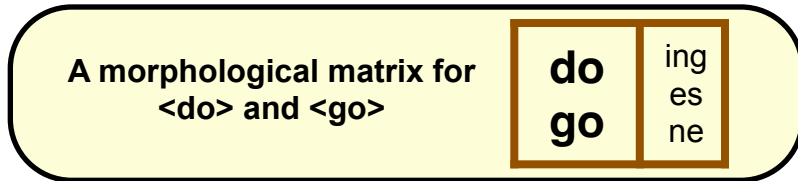
do + es → does

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.



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.

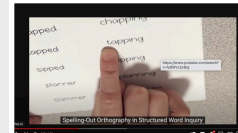
“Teachers who consider English a chaotic and unprincipled writing system likely foster a similar view among their students. Such pupils may not look for patterns in the system because they believe that few exist to be discovered. Teachers who appreciate the writing system can help students find its patterns,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

Treiman and Kessler (2005, p. 133)

Links to Structured Word Inquiry Videos



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



Click [here](#) for a of children “spelling-out orthography” to draw attention to graphemes, morphemes and suffixing changes.

See [this page](#) on my website for more videos and resources on this topic.

[WordTorque](#) has a great page on this [here](#).



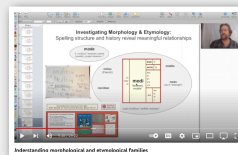
Click [here](#) for a video of Pete using the matrix and word sum to explain the spelling of “does” to a young class.



Click [here](#) for an inspiring video 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](#) 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.

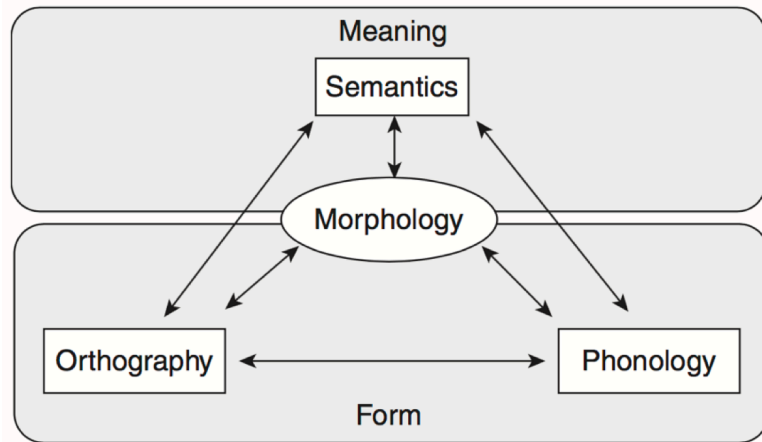


Click [here](#) for a video of Pete walking the viewer between the relationship between morphological and etymological families. This is a key topic for being able to construct your own matrices.

- Explore a bank of videos of structured word inquiry in classrooms at this [YouTube page](#).
- Videos on SWI theory research and practice and many other resources are on my [AboutWordWorks](#) page.

Binding Agent Theory of Morphology

(Bowers & Kirby, 2010; Kirby & Bowers, 2017)



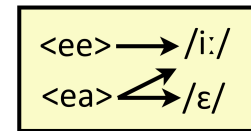
The “binding agent theory of morphology” was first described in the Grade 4/5 vocabulary intervention ([Bowers & Kirby, 2010](#)) that tested a form of instruction we called “Structured Word Inquiry” (SWI). This instruction used the morphological matrix and word sums to teach how English orthography favours consistent spelling of meaning over consistent spelling of pronunciation. For example, we used grapheme-phoneme diagrams to provide a concrete representation of the different phonemes the <ea> digraph represents in “heal” and “health.” This instruction leverages the unique capacity of morphemes to have spellings, pronunciations and meanings. [Kirby and Bowers \(2017\)](#) outlined this theory in more detail and introduced a visual representation like the one above.

Perfetti (2007) argued that increased binding between any two of the three features of word identity (pronunciation, spelling and meaning) results in increased lexical quality for the word. The Active Reading Model, ([Duke & Cartwright, 2021](#)) emphasizes both “morphological awareness” and “spelling-meaning-pronunciation flexibility” as important “bridging processes” between word recognition and language comprehension. Other theories point to the crucial interrelation of morphology with spelling, pronunciation, and meaning, including Triple Word Form Theory (Berninger et.al, 2006) and the Morphological Pathways Framework (Levesque & Deacon, 2021).



heal + ing → healing
 heal + ed → healed
 heal + th → health
 heal + th + y → healthy
 heal + th + y/i + er → healthier

<heal> matrix from [Real Spelling](#)



< ea >	
“long e” /i:/	“short e” /ε/
heal	health
healing	healthy
healed	healthier

Current reading theory brings new emphasis to the interrelation of morphology, phonology and orthography for literacy learning. Typically, however, this theory comes with few or no instructional recommendations. By contrast, the “morphology as a binding agent” theory was developed in conjunction with instructional practice. Teachers have been working with matrices and word sums from Real Spelling since before 2001. (Current Real Spelling resources are [here](#).) Marcia Henry (2003/2010) emphasized these tools in “Unlocking Literacy.” Professional development in SWI is now widely available.

[Share \(2021\)](#) argued that the interrelation of morphology, phonology and orthography has only received the research attention it deserves in the past decade. Despite that delay, there is a network of educators who have been developing instructional practice targeting this exact content for two decades. Instructional studies should work to identify weaknesses and strengths of current practices targeting current reading theory. We hope our matrix study ([Ng, et al., 2022](#)) was just a first small step in that effort.

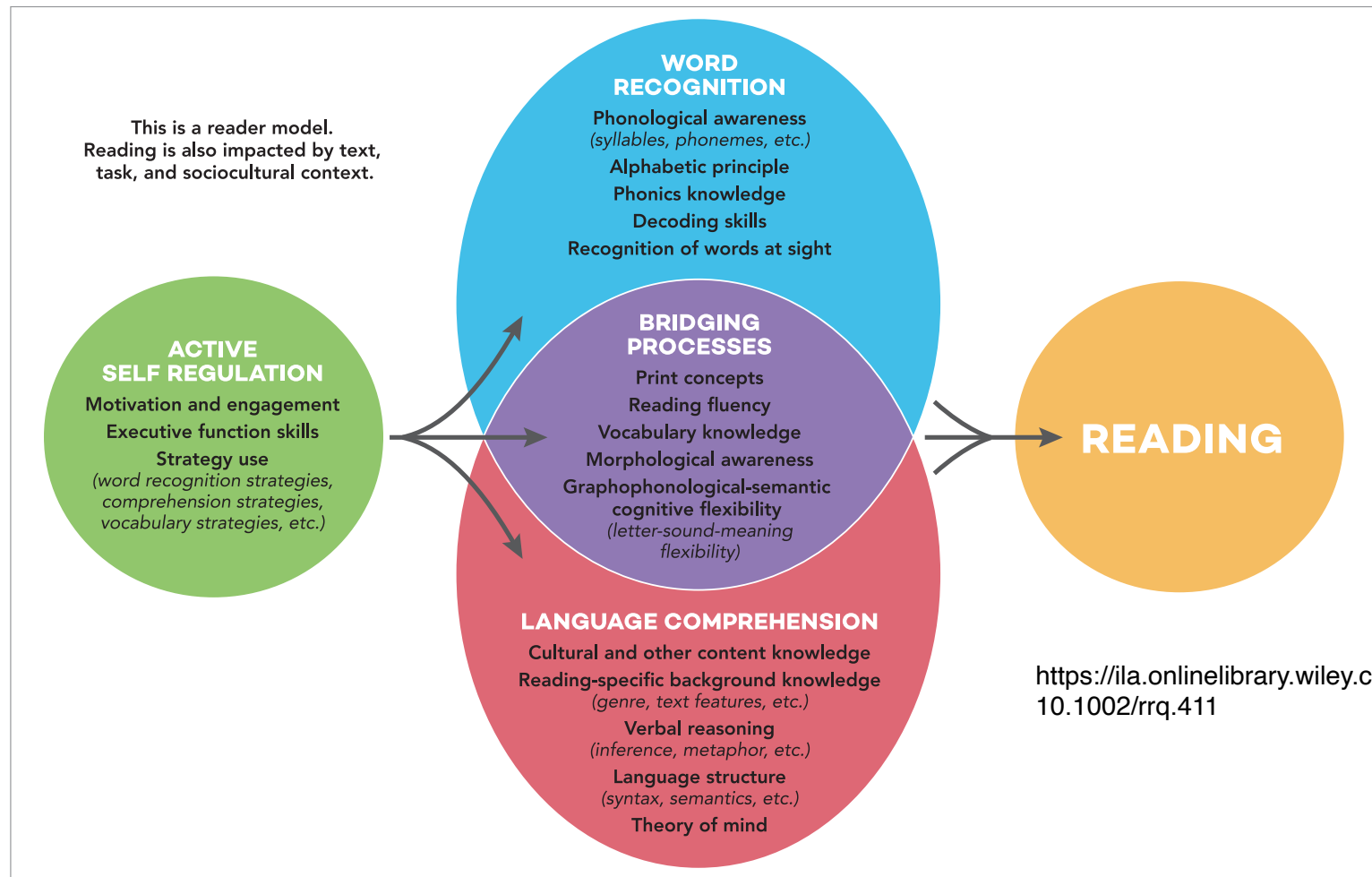
See a Grade 1 SWI lesson addressing these same ideas [here](#).

See an illustration of spelling-meaning correspondences from etymology [here](#).

See a video on the interrelation of morphology and grapheme choice [here](#).

See ([Bowers, 2022](#)) for an accessible article on the theory, research and practice of SWI.

FIGURE 2
The Active View of Reading Model



Note. Several wordings in this model are adapted from Scarborough (2001).

The above model is from [Duke and Cartwright \(2021\)](#). This model updates the Reading Rope Model (Scarborough, 2001) which specified no role for morphology and treated Word Recognition and Language Comprehension as separate domains. This model highlights the interrelation of these domains from the start, and shows that a key aspect of this overlap is with morphological awareness and “letter-sound-meaning flexibility. Our morphology as a binding agent model (previous page) and other models point to this interrelation as well. Educators working with SWI and Real Spelling have been refining practice addressing these aspects of language for two decades.

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.com>

This is the most comprehensive reference for studying how English spelling works. It reference is the source that launched SWI.

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.

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.

Her book “**Beneath the Surface of Words**” should be essential reading for anyone working with SWI - and I would argue for any literacy course in a faculty of education. Find [HERE](#).

Gail Venable: [Backpocket Words](#) is a must for those working with SWI.

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. Especially for early literacy.

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.

Mary Beth Steven: <https://mbsteven.edublogs.org> Mary Beth’s site includes an incredibly rich archive of posts with videos and discussions of investigations in her Grade 5 class. She also has many excellent on-line courses for teachers.

LEX: Linguist-Educator-Exchange (LEX grapheme cards and more)
Click [HERE](#) for Gina Cooke’s exceptionally rich, linguistically accurate resources.

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

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](#).

Some References

- Bowers, P.N. (2021, February 5). [Structured Word Inquiry \(SWI\) Teaches Grapheme-Phoneme Correspondences More Explicitly Than Phonics Does: An open letter to Jennifer Buckingham and the reading research community](#). <https://doi.org/10.31234/osf.io/7qpyd>
- Bowers, J.S., Bowers, P.N. (2019). [A case for why both sides in the ‘reading wars’ debate are wrong — and a proposed solution](#). *Washington Post* article.
- Bowers, J.S., Bowers, P.N. (2018). [Progress in reading instruction requires a better understanding of the English spelling system](#). *Current Directions in Psychological Science* 27, 407-412.
- Bowers, J.S., Bowers, P.N. (2017). Beyond Phonics: [The Case for Teaching Children the Logic of the English Spelling System](#). *Educational Psychologist*, 2, 124-141.
- Bowers, P.N., & Kirby, J. R. (2010). [Effects of morphological instruction on vocabulary acquisition](#). *Reading and Writing: An Interdisciplinary Journal*, 23, 515–537.
- Bowers, P.N., Kirby, J.R., & Deacon, S.H. (2010). [The effects of morphological instruction on literacy skills: A systematic review of the literature](#). *Review of Educational Research*, 80, 144–179.
- Chomsky, C. (1970). [Reading, writing, and phonology](#). *Harvard Educational Review*, 40, 287–309.
- Goodwin, A.P., & Ahn, S. (2010). A meta-analysis of morphological interventions: effects on literacy achievement of children with literacy difficulties. *Annals of Dyslexia*, 60,183–208.
- 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. Parrilla, (Eds.), *Theories of reading development*. Amsterdam, NL: John Benjamins Publishing Company.
- Melvin Ng, Peter N. Bowers and Jeffrey S. Bowers (2022). [A promising new tool for literacy instruction: The morphological matrix](#). *PLOS One*, 1-18. <https://doi.org/10.1371/journal.pone.0262260>

Consonants		
<p>Unvoiced</p> <p>/p/ <u>pan</u></p> <p>/t/ <u>to</u></p> <p>/k/ <u>cuts</u></p> <p>/f/ <u>fan</u></p> <p>/θ/ <u>think</u></p> <p>/s/ <u>sip</u></p> <p>/ʃ/ <u>shop</u></p> <p>/tʃ/ <u>chop, batch</u></p> <p>/ks/ <u>fox, Texas</u></p>	<p>Voiced</p> <p>/b/ <u>ban</u></p> <p>/d/ <u>do</u></p> <p>/g/ <u>go</u></p> <p>/v/ <u>van</u></p> <p>/ð/ <u>this, that</u></p> <p>/z/ <u>zip</u></p> <p>/ʒ/ <u>vision</u></p> <p>/dʒ/ <u>gym, badge</u></p> <p>/gz/ <u>exactly</u></p>	<p>Liquids</p> <p>/ɔɹ/ <u>for</u></p> <p>/ɑɹ/ <u>car</u></p> <p>/ə-/ <u>mother</u> (unstressed)</p> <p>/ɜ-/ <u>purple</u> (stressed)</p> <p>/ɹ-/ <u>fear, sheer</u></p> <p>/ɛɹ/ <u>bear, air</u></p> <p>/l/ <u>love</u></p> <p>/ɹ-/ <u>room</u></p>
<p>Nasals</p> <p>/m/ <u>money</u></p> <p>/n/ <u>knight</u></p> <p>/ŋ/ <u>song</u></p>	<p>Other</p> <p>/kw/ <u>qu</u>ick</p> <p>/h/ <u>h</u>appy</p>	<p>/r/ <u>l</u>ittle, <u>l</u>adder</p>
Vowels		
<p>/æ/ <u>a</u>t</p> <p>/ɛ/ <u>E</u>d</p> <p>/ɪ/ <u>i</u>t</p> <p>/ɑ/ <u>o</u>ff, <u>f</u>ather</p> <p>/ʌ/ <u>u</u>gly (stressed)</p> <p>/ə/ <u>a</u>round (unstressed)</p> <p>/ʊ/ <u>b</u>ook</p>	<p>/eɪ/ <u>a</u>id</p> <p>/i:/ <u>e</u>at (stressed)</p> <p>/i/ <u>h</u>ungry (unstressed)</p> <p>/aɪ/ <u>t</u>ry, <u>m</u>ight</p> <p>/oʊ/ <u>o</u>ver</p> <p>/u:/ <u>m</u>oon</p> <p>/ju/ <u>U</u>nited States</p> <p>/ɔɪ/ <u>b</u>oy</p> <p>/aʊ/ <u>c</u>ow</p>	
Semi-vowels		
<p>/w/ <u>w</u>in</p>	<p>/j/ <u>y</u>es, <u>K</u>atja</p>	

Prefixes

and their variations

this list is not exhaustive

A good dictionary will list prefixes as separate entries

a- (OE)	cata- cath- cat-	hyper-	poly-
a- (Gk) an-	circum-	hypo- hyp-	post-
ab- abs-	com- co- col- con- cor-	in- il- im- ir-	pre-
ad-	contra- contro-	infra-	pro-
a- ac- af- ag- al- an- ap- ar- as- at-	de- di- dia- dis- dif- di-	inter- intra- intro-	re- red-
al- (OE)	dys- ec- en- em-	male- mal-	retro-
amb-	epi- eph- ep-	meta- meth- met-	se-
amphi-	eu- ex- e- ef-	mis- mono- mon-	semi-
ana- an-	extra- for-	non-	sub- suc- suf- sug- sum- sup- sur- sus-
ante-		ob- o- oc- of- op-	super-
anti- ant-		para- par-	syn- sym- syl- sys- sy-
apo- be-		per-	tele-
bene-		peri-	trans- tra- tran-
bi- bin-			ultra-
by-			un- with-



Many elements claimed as "prefixes" are not necessarily so. For instance, <mid> and <fore> are bases, so <midday> and <forecast> are actually compound words.

