

**Supplemental Material S1.** Examples of morphological intervention strategies, techniques, and tools.

Script or Example(s) of Strategy	Visual Example	In Research
<p><b>EXPLICIT INSTRUCTION OF A MORPHEME’S MEANING OR PURPOSE</b>                      Educators explain the meaning or denotation of an affix, base, or etymological marker. Educators may then use words that contain a given base or affix in a sentence or provide multiple examples of words containing this base or affix. Students are often encouraged to find or think of other words that are similar to the example provided.</p>		
<p><b>Affix Instruction</b>                      “Prefixes attach to the beginning of words and change the word’s meaning. The prefix &lt;re-&gt; sometimes has the job of meaning “to do something again.” For example, we could <i>watch</i> a movie for the first time, and then <i>rewatch</i> that movie the next day. The &lt;re-&gt; at the beginning of the word indicates that we did the action again. We <i>rewatched</i> the movie a second time. Can you think of other words that start with &lt;re-&gt; that mean to do something again?”</p>	<p><i>to do something the first time</i></p> <p>watch play heat build wash</p>  <p>&lt;re-&gt; <i>to do something again</i></p> <p>rewatch replay reheat rebuild rewash</p>	<p>Abbott &amp; Berninger, 1999                      Apel &amp; Diehm, 2014                      Denston et al., 2018                      Kirk &amp; Gillon, 2009</p>
<p><b>Base Instruction</b>                      “You all <i>know</i> a lot of things. The word <i>know</i> means that you have information in your mind, as in the sentence “I <i>know</i> the rules of the game.” If I wanted to talk about someone else, I could say “He <i>knows</i> the rule of the game.” He must have a lot of <i>knowledge</i>! That’s another word that shares meaning with the word <i>know</i>, except knowledge isn’t something we do, it’s what results when we know things.” Who wants to be a <i>know-it-all</i> and say another word that belongs in the “<i>know</i>” family?”</p>	<p><i>know</i> <i>knows</i> <i>knowledge</i></p>	<p>Abbott &amp; Berninger, 1999                      Apel &amp; Diehm, 2014                      Goodwin, 2016                      Henry, 1989                      Nunes, Bryant &amp; Olsson, 2003</p>
<p><b>Bound Base Instruction</b>                      “We have talked about bases that can stand alone and have meaning, like the word dog or cat. Other morphemes, called bound bases, give the major meaning of the word, but are not a word by themselves. In the words <b>structure</b>, <b>construct</b>, <b>construction</b>, and <b>instruction</b>, for example, there is a bound base &lt;struct&gt;. Although &lt;struct&gt; is not a word that you can use by itself, it has the meaning of “build” that is found in all these example words.”</p>	<p>&lt;struct&gt;                      structure                      construct                      construction                      instruction</p>	<p>Abbott &amp; Berninger, 1999                      Bowers &amp; Kirby, 2006                      Henry, 1989                      McCutchen et al., 2014</p>

***Etymological markers***

“Some words have markers in them that help us learn of a word’s history or story. If the marker wasn’t there, we wouldn’t be able to see the word’s history. For example, the word **two** has a <w>, yet we don’t hear the /w/ when we say the word **two**. That <w> is an etymological, or historical, marker that shows us how the word **two** is related to other words that mean something similar, like **twin**, **between**, and **twelve**. In these words, you hear the /w/ and see the <w>.”

two  
twin  
between

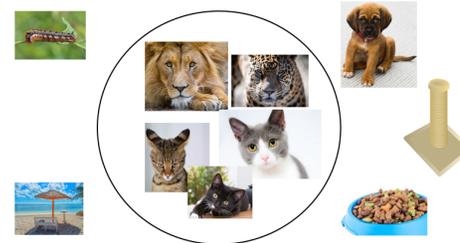
Abbott & Berninger, 1999  
Bowers & Kirby, 2010  
Devonshire, et al., 2013  
Henry, 1989

**WORD RELATIVES / WORD FAMILIES**

An activity that encourages students to reflect upon the meaningful relationship between a base element and other words that share the same base, discarding words whose spelling or meaning may be similar to the base, but yet do not contain the same morphemes. Typically, this activity is introduced using the analogy of our family members and friends, or may also include animals, and provides a foundation in understanding the relationships that govern words based on meaning and appearance (i.e., spelling and pronunciation).

***With Images***

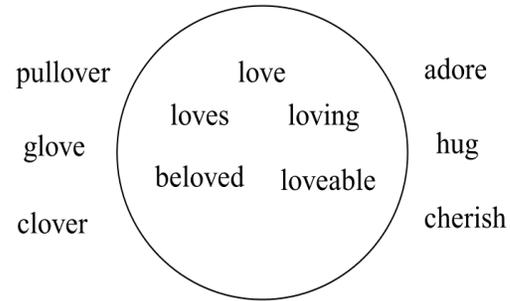
“We all have family members. Sometimes, our family members look like us or sound like us and sometimes they don’t. In these pictures, we see the cat family. Some of the cat’s family members look like a regular house cat, but are different colors. Other cats, such as lions and jaguars, are also in the cat family, even though they are different in size, type of fur, and the noises they make. This idea of looking alike or different, and sounding alike or different is a similar pattern to what we observe in how words are spelled or pronounced.”



Apel, Brimo, Diehm, & Apel, 2013  
Apel & Diehm, 2014

**With Words**

"I'd like for you to read the word on the card and determine which words are part of the same family. In order for the words to belong to the same family, the words should mean similar things, but also share some of the same graphemes. <Adore> and <love> mean the same thing, but do not share the same written structure. Therefore, <adore> is not part of the <love> family so it goes outside the circle. You may also see word cards where the word looks like belongs in the family because it has the same letters, like <glove>, but it doesn't share meaning so it also goes outside the circle. Why don't you try sorting the rest of these cards."



Bowers & Kirby, 2006  
Brinchmann et al., 2016  
Goodwin, 2016  
Wolter & Green, 2013

**WORD SORT**

Word sorts encourage self-discovering of an orthographic regularity (e.g., plural <-s> marker may be pronounced /z/, /s/, and /əz/, but it will always be spelled with <-s> or <-es>). Therefore, suffixing conventions (e.g., consonant doubling, replacing final vowel of a word when adding a vowel suffix, changing <y> to <i>) are ideal candidates for instruction. Students sort words into groups based on their hypotheses about spelling, structure, meaning, etc.

**Orthographic Suffixing Conventions**

"Sometimes, when we add a suffix to the end of the word, we have to modify the base word in order to let the suffix "fit." In these cards, you're going to see that sometimes when we add the <-ing> suffix, the silent <e> in the base word is hidden. Try to sort these cards into groups based on what you hear when you say the word, or what you see in the words' spellings."

excite	exciting	see	seeing
make	making	look	looking
like	liking	read	reading
leave	leaving	know	knowing
have	having	find	finding
blame	blaming	tell	telling

Apel et al., 2013  
Apel & Diehm, 2014  
Wolter & Green, 2013

**Phonological Changes with Orthographic Consistency**

"These cards contain plural words, but you'll see that there are some differences. For example, in the word "dogs," I hear /z/ at the end. In the word "cats," I hear /s/ at the end. Try to sort these cards into groups based on what you hear when you say the word, or what you see in the words' spellings."

/z/	/s/	/əz/
dogs	cats	buses
games	weeks	bridges
bags	briefs	slices
bells	pups	pieces
cows		

Apel et al., 2013  
Apel & Diehm, 2014  
Wolter & Green, 2013

## WORD DECOMPOSING

Generally after explicit instruction of a target base or affix, the educator may present polymorphemic words to students and ask the students to break the words apart into their constituent morphemes. Constituent morphemes (i.e., affixes or bases) may be placed on a word wall. Instruction using compound words (i.e., words with two bases) has also been done. Foil words may be incorporated as appropriate. This type of activity is often referred to as morphological problem solving. Educators may also encourage students to find a target base or affix within a book they are reading, or read to students and ask students to raise their hand when they hear a word with a target base or affix.

### *Decomposing to Understand the Meaning of Affixes*

“We have been discussing the past tense <-ed> suffix. Let’s look for this suffix in a few words. The words **signed**, **mailed**, and **rained** all include the <-ed> suffix and indicate that the action happened in the past. “Yesterday it rained.” There are of course other words that contain <-ed> but do not share the meaning of “in the past.” For example, words like **greed** and **red** contain the letters <ed> but the <ed> is part of the base and not a suffix meaning that an action happened in the past.”

### *Sample excerpt from a text:*

I was beginning to hate Mount Flo. It rained for nine days. By the seventh day, I signed my name on the lease termination and mailed it. Good riddance. Hopefully the landlord isn’t filled with greed, and allows me to move quickly. My bank account will go in the red if I have to pay for two apartments.

Brinchmann et al., 2016  
Denston et al., 2018  
Goodwin, 2016  
McCutchen et al., 2014

### *Decomposing to Understand the Meaning of Compound Words*

“Sometimes we have big words that are made up of two little words, or two bases. For example, in the word <raincoat>, we see and hear the words <rain> and <coat>. Therefore, a raincoat is a coat that you put on when it rains. Let’s draw a box around the two little words that we see in this big word. Now let’s look at the word <mailbox>. Do you see any smaller words, or what we call bases, within the word <mailbox>? If you do, draw a box around the words. So what does a mailbox mean?”



Arnbak & Elbro, 2000  
Henry, 1989  
Lovett et al., 2000

**WORD BUILDING**

In word building, educators provide students with base and affix cards. Students may play around with the cards to build words comprised of more than one morpheme, possibly using bases or affixes on the classroom word wall as well. Students may build non-words (e.g., angryful) in addition to real words. This is an opportunity to talk about the words, look them up in a dictionary, and attempt to use them in sentences to determine which words are currently real or not.

“That rain sure is coming down out there! Hmmm, how could I talk about “rain that is coming down now” in a different way? The word <rain> plus the <-ing> suffix would be <raining>, which means the rain is happening now. It is raining. But man...I sure don’t trust this umbrella to keep me dry when we go out for recess. How could I say “do not trust” in a different way? I know! I could put the prefix <dis>, which we learned can mean “apart” or “not,” in front of the base word <trust>. That forms a new word **distrust**, which means “not trust.”

Bases		Affixes	
free	bound	prefixes	suffixes
know	struct	re-	-ing
rain	spond/sponse	un-	-s
sign	duce/duct	dis-	-ed
mail	nate	pre-	-ful
hug	gust	ir-	-ly

Brinchmann et al., 2016  
Wolter & Green, 2013

**WORD SUMS**

Word sums explicitly show the morphological structure of words and any suffixing changes needed to derive the surface spelling of the word. A word sum activity starts with making a hypothesis about how a word is built (i.e., what its constituent morphemes are). Writing the word sum provides a test of the hypothesis - if the word sum doesn’t work then the hypothesis was likely false.

“Let’s think of words that belong in the <please> family. That means all of the words will share structure, that is the base <please>, and will share the meaning of “agreeable.” Shout out words that you think are in the <please> family [SLP writes these down, even if incorrect answers are given]. The first word someone said was <displease>. We learned of the <dis> prefix last week, so yes, this word sum would work: <dis-> + <please> is rewritten as, check the joins, <displease>. Let’s look at <pleased> now. What is your hypothesis about the word sum? <please> + <ed> is correct, except here, when we check our joins, we find that we need to hide the <e> of the base before we can add the suffix <-ed>.”

dis + please → displease  
 please/ + ed → pleased  
 please/ + ant → pleasant  
 please/ + ure → pleasure  
 plea + s → pleas \*\* Not in the family

Bowers & Kirby, 2010  
Devonshire et al., 2013

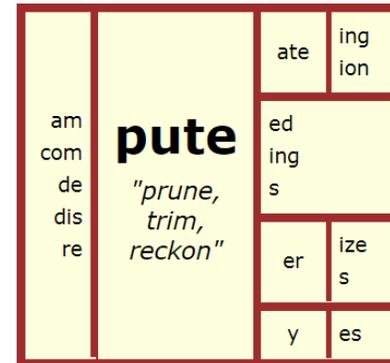
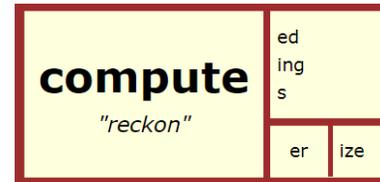
Note: the </> stands for the replacement of <e> by a vowel-initial suffix

## WORD MATRICES

Word matrices are a visual representation of a family of words that share both structure and meaning. As such, word sums and word matrices are generally used together. Matrices may be as simple or elaborate as desired, given educator and student knowledge. For example, <computer> and <ampute> can both be connected to the Latin word *putare*, meaning "prune, trim," as extended denotations also included "arrange, set in order" and "count, compute." You may develop either matrix shown below based on your current understanding of the family. The Mini Matrix-Maker website may be used to build matrices

<http://www.neilrammsden.co.uk/spelling/matrix/index.html>

"Yesterday we came up with several hypotheses about words that belong in the <compute> family. After we made word sums, and tested our hypothesis to make sure our base is spelled correctly, we came up with five words that we then put on our word family map, or what we call a matrix. Remember, we need to read this map from left to right. If there is a vertical bar, that means that we are going to add an affix... and if we run into two vertical bars while making a word, that means we will end up with a word that has two affixes. For example, the words in this matrix are: <computed, computing, computes, computer, computerize>."



Bowers &  
Kirby, 2010

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