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Helping Students with Dyslexia Read Long Words: Using Syllables and Morphemes

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Students with dyslexia have great difficulty reading words with more than one syllable, polysyllabic words. This article describes efficient,evidence-based practices to help students read these words. The strategies include: (a) identifying syllables in words using simple principles, (b) knowing different pronunciations of single-letter vowel sounds, (c) reading polysyllabic words using a flexible strategy, (d) practicing correcting mispronunciations, (e) practicing pronouncing affixes in words to mastery (f) reading words by identifying affixes and base words, and (g) reading words in morphological word families.

Nicholas is a fifth grader with dyslexia. Like most students with dyslexia, he has difficulty processing sounds in English words. Nicholas has good listening comprehension. When texts are read to him, he summarizes key points correctly. At the end of third grade, he was diagnosed with a learning disability in reading, with particular emphasis on word reading difficulty—i.e., dyslexia. In fourth grade, he worked with Ms. Lyon, the special education teacher, on word reading skills every day for 45 minutes in a group of 5 students with similar needs.

The program Ms. Lyon used, Illuminating Letters *(not a real program, although similar to many), was designed for students like Nicholas. It provided instruction on the production and identification of English sounds (phonemes) and predictable relations between sounds and letters/letter combinations. The program was carefully sequenced, moving from simple high-frequency letter-sound combinations to more complex ones, and the instruction was clear and explicitfollowing principles of effective explicit instruction (Cohen, 2018). Nicholas started fourth grade reading 45 correct words per minute on first-grade passages. When Ms. Lyon assessed him at the beginning of fifth grade, he could read 80 correct words per minute on a third-grade passage and correctly read and spell words with as many as seven sounds (e.g., scripts). When he read accurately and fluently, he had good reading comprehension. Nicholas had made so much progress that Ms. Lyon began reading third-grade texts with him. This did not go as well as she hoped–Nicholas made a lot of errors.*

There was some good news: Nicholas read many short words in the passages correctly. She saw this as evidence that he was using the strategies he had learned in the program. Ms. Lyon examined his errors (see Table 1 for examples) and noticed these patterns:

- *Saying a word that makes sense in the context of the sentence but is not the word on the pagehe did this five times,*
- *Responses that are not real words for unfamiliar words–"muss-on" for* mason,
- *Switching long sounds with short sounds or the reverse–*decent, habit, mason,
- *Inattention to base words and affixes, and*
- *A lack of familiarity with longer more difficult affixes (e.g.,* -ious *in* glorious).

Most striking was that every error involved a word with more than one syllable. She also noticed that he would often slow down on longer wordseven if he said them correctly. Ms. Lyon realized that she needed to address Nicholas's challenges with long words more directly.

The English Spelling System, Dyslexia, and Polysyllabic Words

Learning to read English is more difficult than in most other alphabetic languages (Seymour, Aro, Erskine, & the COST Action A8 Network, 2003). It sometimes seems there are not reliable rules for linking letters with sounds. The letter *e* makes a different sound in *scenic*,

Table 1: *Nicholas's Word Reading Errors and Explanations*

		Actions Showing Skill	
Printed Word	Pronunciation	Acquisition	Difficulty
adventure	advice	says the first three sounds correctly	guesses after first part
amid	ay-mid	gives a plausible pronunciation	uses long sound instead of schwa
beautiful	beetle	says most of the first syllable correctly	does not notice base word and suffix
glorious	glory	pronounces base word correctly	skips the suffix; uses context
decent	deck-ent... dess-ent... IDK	gives plausible pronunciations	uses short sound instead of long
inability	unable... un...tie... tee	attempts to use meaningful parts	does not know suffix
justice	just-ice	gives a plausible pronunciation	uses long sound instead of schwa
mason	mass-on... muss-on	gives plausible pronunciations	uses short sound instead of long sound
mysterious	mystery... IDK	recognizes base word	does not know suffix
replaceable	IDK		challenged by number of vowel letters
springtime	spring	knows first word in compound	ignores second word in compound

Note. IDK means Nicholas said "I don't know"; ... means he paused. Schwa is the /ə/ sound, the short "uh" sound used in unstressed syllables, like the a in about. The "use of context" column indicates whether Nicholas's error indicates he may be using the information about other words in a sentence to support pronunciation.

mentor, and *Daniel* and is silent in *distance*. It combines with *i* to make the long-*e* (/i/ or /ē/) sound in *chiefly*.[1] Figure 1 shows many different ways that *e* is used. The long *a* sound (i.e., /eɪ/ or /ā/) can be spelled many different ways, as Figure 1 also shows. In short, English is tricky to learn to read because letters connect with sounds in complex ways (Venezky, 1999). An English letter can be used to make many different sounds (either alone or with another letter), and sounds can have multiple spellings.

English has a unique spelling system because its words have origins in multiple languages, Germanic (Old English), French (and Latin), and Greek (Balmuth, 1982), compared with languages like Spanish where words are mostly from Latin (and sometimes Arabic). The different languages have different ways of pronouncing words, and this affects spelling. For example, the past tense (of Germanic origin) has one spelling but three pronunciations in *washed*, *waved*, and *wanted*, words from French often have unpronounced letters, like the *o* in *famous*, and the consonant cluster*ps* in *psychology* is a remnant of Greek pronunciation. In addition, new words often retain spelling patterns of their language of origin. For example, the letter *i* typically does not appear at the end of English words, but it does in *spaghetti* (Italian) and *sushi* (Japanese). Thus, teaching students all of the letter patterns they may find in texts is no simple task.

Students like Nicholas struggle processing the sounds in words, so even words with simple spellings are difficult. Words with complex letter patterns place an even greater burden on their memory systems and make accurate reading even harder. As a result, students with dyslexia often read slowly and guess at difficult words. We once observed a student with dyslexia try to read circus. He glanced at it briefly and then at the ceiling: Why? He did not believe that he could figure out the word from the letters and was looking for help elsewhere, perhaps scanning all of the words he knew for one that would fit the sentence. Students need strategies to digest information about English sound-spellings without frustration.

The good news is that English has many "exemplary regularities" (Perfetti, 2003, p. 12). Many consonants are pronounced as expected in almost all words. For ex-

[1] We give the pronunciation symbols in pairs, first the International Phonetic Alphabet version and then that typically used in the dictionary

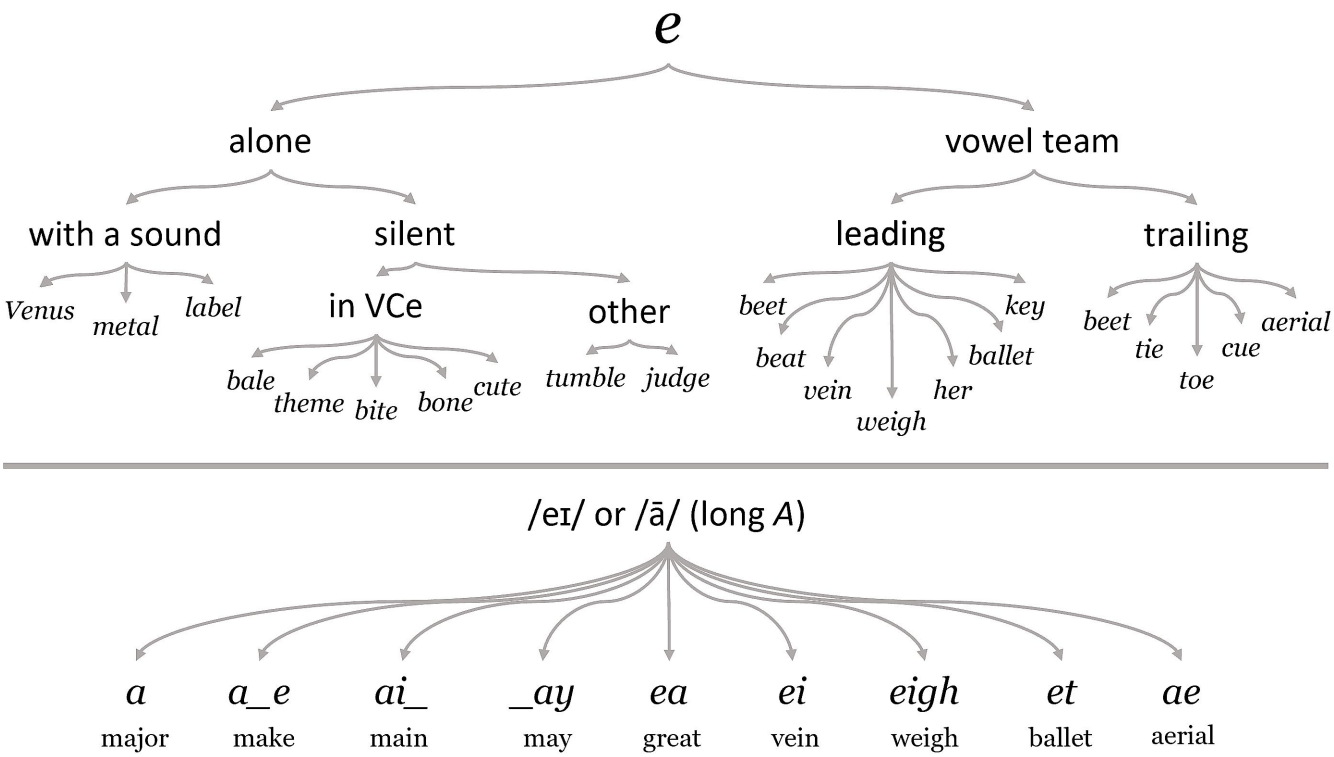

Figure 1: *Top section: Categories and examples of graphemes that include the letter E. "Alone" indicates that the letter e is not next to a vowel in the same syllable. "Vowel team" indicates that the grapheme is defined by a pair of letters that represent one phoneme or diphthong. "Leading" indicates cases where the e is the first letter in the grapheme; "trailing" indicates it is the second. VCe refers to patterns where a vowel (V) is followed by a consonant (C) and the letter e. In these cases, the vowel makes its long sound and the e is silent. The "other" silent category includes cases where e is used to mark a word feature, like g saying /ʤ/ or /j/ when followed by e or to make clear that a final s is not plural (e.g., tens versus tense). Bottom section: Different spellings that are used to represent the long a–i.e., /eɪ/ or /ā/–in typical dictionary codingsound (bottom). The blank (underscore) indicates that the given spelling is used mostly when a consonant appears in that location (e.g., the ai grapheme for long a rarely ends a word and ay almost never starts one).*

ample, the letter *m* reliably represents the sound /m/ in reading and spelling. Teachers can help students by teaching them these regularities one-by-one, slowly expanding students' understanding of the sound-spelling system. We have sometimes called this (to ourselves, not students) "the Treasure Hunt," a playful way of describing how teachers introduce the complexities gradually. The trick of the game is that the complexities (like each clue) were always there; teachers just begin with the simplest consistent patterns and hide the rest until students are ready to learn them. For example, with the letter e, teachers would start with the simple short-*e* (/ɛ/ or /ĕ/) sound and expand to *ee*, *ea*, and so on. The alternative to this trick is not effective: Telling students with dyslexia that "English spelling does not make sense" only increases their anxiety and frustration with reading. By carefully leading students through the Treasure Hunt, students learn to trust the letters–rather than the ceiling.

Ms. Lyon supported Nicholas in Illuminating Letters *by teaching each sound-spelling to mastery. She helped him build this knowledge systematically, focusing his attention on the exemplary regularities. This helped Nicholas make tremendous gains in fourth grade.*

Table 2 provides definitions for words and phrases like "sound-spelling" that we use in this paper and that are found in other educational resources.

Challenges After Beginning Word Reading: Long Words

Nicholas's fifth-grade struggles reflect one limitation of Illuminating Letters and many similar programs: a focus mostly on monosyllabic words. The problem is that many words are polysyllabic[2]. In fifth grade texts, more

[2]We use the term *polysyllabic* rather than *multisyllabic* because *syllable* is a word of Greek origin and *poly-* is an affix used for words of Greek origin. It also matches the word *monosyllabic* because *mono-* is also a Greek affix. *Multi-* is an affix for Latin words. We just prefer the

Table 2: *Definitions of Terms Related to Polysyllabic Word Reading*

Term	Meaning	Examples
sound-spelling	a term to describe a connection between a phoneme and a grapheme	*a* = short *a* as in *cat igh* = long *i* as in *high*
grapheme-phoneme or sound-symbol correspondence[a]	synonyms for sound-spelling	
spelling pronunciation	what a reader says when they put together all the sounds in a word (maybe incorrect)	"mass-sawn," "may-sawn," and "may-sun" for *mason*
grapheme	a spelling unit of one or more letters	*a, ay, dge, and igh*
vowel letter	a single letter that represents a vowel sound on its own	*a, e, i, o, u*, and *y* in *bat, bet, bit, bot, but*, and *by*
team[b]	a grapheme of two or more adjacent letters that represent one vowel sound	*ai, ay, aw, oi, oy, ou, ow*
diphthong[c]	a vowel team where two vowel sounds are spoken together in the same syllable	*oi/oy* and *ou/ow* for *boil, boy, bout*, and *bowed*
phoneme	a single sound	/æ, /m/
vowel (or vowel phoneme)	a sound where air flows through the mouth unobstructed, differentiated by the shape of the mouth and the distance of the tongue from the roof of the mouth; a vowel is a sound, not a spelling	the long-*e* sound of *ee* in meet is spoken with the tongue close to the roof of the mouth; the sound of *aw* in *hawk* is spoken with the mouth quite open
schwa	a reduced (shortened, quickly pronounced) vowel	*a* in *about*, often represented with /ə/
syllable	a word part that has one vowel sound	
spoken syllable	a part defined by the pronunciation of a vowel	the name *McCready* has three spoken syllables, where the *Mc* represents "muh" (/mə/)
written syllable	a written word part related to a spoken syllable, anchored by a vowel letter or vowel team	*dandelion* contains the syllables *dan-de-li-on* anchored by the letters *a, e, i*, and *o* respectively
morpheme	a meaning unit in a word	
bound morpheme	a morpheme that cannot stand on its own but still has meaning	*-tion* in *action -s* in *sticks*
free morpheme	a morpheme that is a word on its own	*sail* and *boat* in *sailboat*
base[c]	a word (free morpheme) that cannot made into a smaller part that is also a word	*act* (base word for words like *action* and *actor*; also a root) *visual* (base word for *visualize*, *visuals*, etc.; not a root)
base word or root word[d]	synonyms for base	
root[e]	a part of a word that bears meaning, even if it is not a word itself	*vis* (root for words like *visual* and *vision*; not a base word) *act* (also a base word)
word family[f]	a group of words that share the same base word	*natural, unnatural, naturally, unnaturally* (and others for the base word *nature*)

Note. [a]The term letter-sound correspondence" or "letter-sound" is not used here because it gives the impression that letter-sounds pair one letter with one sound. It is not a problem to use the term as long as the meaning is clear to others. [b] This is a term used by educators. It is not used in linguistics. [c]It is conventional to write vowel diphthong, but it would be more accurate to call it a "vowel diphthong spelling." A diphthong is a spoken unit, not a spelling. [d]The words base, root, base word, and root word are frequently confused. The examples are given to clarify. Bases are always words, so we use the term base word to indicate the base (adding "word" clarifies the meaning). We use the term root when describing a bound morpheme inside a base word. A simple rule of thumb is to refer to the base or base word when describing a word that cannot be separated into smaller words and root when describing a meaningful part that is not a word. Base words can contain roots. [e]The term root word is a synonym for a base (word) because it cannot separated into smaller words. We use the term base word for clarity and recommend the same to others. [f]In linguistics, the term word family is related to morphemes. However, in many schools the term word family is used to describe words containing the same body-rime unit (e.g., *cat, rat,* etc. for textit-at).

than 90% of new words are polysyllabic (Kearns & Al Ghanem, in press). These longer words have more sounds to pronounceexacerbating the challenge for students with dyslexia. In polysyllabic words, single-letter vowels*a, e, i, o*, and *u*, and sometimes *y*, bounded by consonants (e.g., the *a* and *i* in *rabbit*)can have different pronunciations. They can have a short sound (*a* in *rabbit*), a long sound (*a* in *major*), or a reduced sound (the schwa /ə/ like the *a* in *about*). Even more challenging is that there are not easy ways to know which sound the letter uses.

Ms. Lyon realizes that Nicholas's real challenge was that he did not understand how the sounds of letters can change in polysyllabic words. Looking at his pronunciations for amid, decent, *and* mason *(Table errors), she sees that he does not know which to pronunciation to choose for the single-letter vowels and that his knowledge from* Illuminating Letters *does not help enough. She needs new strategies for him.*

Strategies to Improve Polysyllabic Word Reading

To help students learn to read polysyllabic words, teachers can use both syllable- and morpheme-based approaches. At the syllable level, strategies include: (a) identifying syllables in words using simple principles, (b) knowing different pronunciations of single-letter vowel sounds, (c) reading polysyllabic words using a flexible strategy, and (d) practicing correcting mispronunciations. For morphemes, the strategies involve teaching the meaning structure of words by: (a) practicing pronouncing affixes in words to mastery (b) reading words by identifying affixes and base words, and (c) reading words in morphological word families. Researchers and educators have created a variety of approaches for teaching these steps to students, including various names and acronyms. We have summarized several of these in Table 3. These strategies have been used in different research studies and shown to have evidence of improving student word recognition.

Syllable-Based Strategies

Although the strategies students use to learn monosyllabic word reading may not apply perfectly to polysyllabic words, they can support reading these words. However, in order to take advantage of this knowledge, students need to identify the syllables within a longer word. Syllable-based strategies provide guidance for students to do just this.

consistency of *polysyllabic*, but we do not think it is a problem to use *multisyllabic* either.

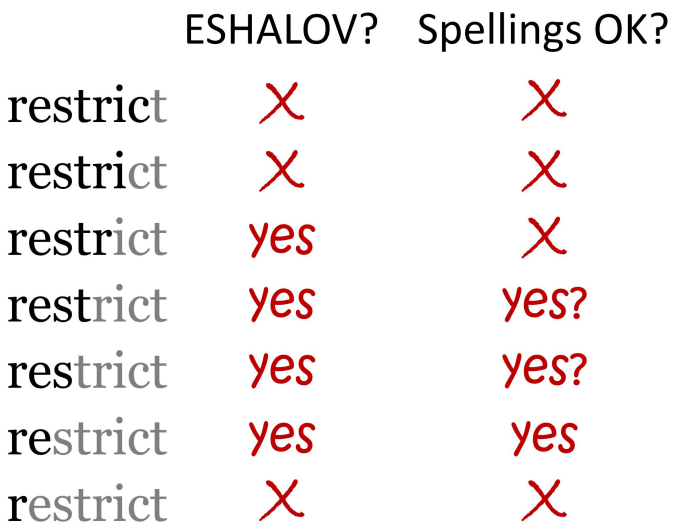

Figure 2: *Representation of separations between syllables (black versus gray letters) that follow the "every syllable has at least one vowel" (ESHALOV; O'Connor et al., 2015) principle and the OK spelling principle. These are marked "yes" if they fully follow the principles, "yes?" if it is unclear, or "X" if they do not.*

Identifying syllables.

Identifying syllables in written words requires two pieces of knowledge: (a) syllables almost always have a vowel letter, and (b) syllables can only be divided so that they start and end like monosyllabic words do. We have sometimes explained it to students this way: Every part (syllable) has a vowel, and every part has to look OK.

One important fact about syllables is that every syllable has a vowel sound. This means that almost all written syllables also have a vowel letter. Therefore, one evidence-based strategy is to teach students to divide words into parts so every syllable has a vowel letter. O'Connor and colleagues (2015) included this principle in their successful intervention. They used the phrase "every syllable has at least one vowel" or ESHALOV (see Table 3). Figure 2 shows different divisions of the word *restrict*. In some cases, the division follows ESHALOV (e.g., *re-strict*) and in some it does not (e.g., *r-estrict*).

The second fact is that printed syllables must be divided into parts that follow English rules about the location of letters in words. This means that syllables cannot begin with consonant clusters that could not start a word (e.g., *ck, st, nd*) or end with clusters that cannot end a word (e.g., *str, gr, bl*). Figure 2 shows what does and does not work for *restrict*. In the word *lantern*, *la-ntern* is not an appropriate division because the second syllable would be *ntern*, and *nt* cannot begin a word (Taft, 1979).

Table 3: *Different Approaches to Help Students Break Words into Syllables*

Technique	Description	Sources
Every Syllable Has At Least One Vowel (ESHALOV)	"(a) underline all of the vowels in a long word (e.g., (*unavoidable*), (b) join any vowel teams into one vowel sound (i.e., *oi*), (c) identify known word parts (i.e., *un-*, *-able*), (d) count the number of word parts to expect (i.e., 5), (e) break the word into parts for decoding (i.e., *un-a-void-able*), and (f) try a pronunciation of the word."	O'Connor et al. (2015, p. 408)
BEST	"(a) break it apart, (b) examine the base word, (c) say each part, and (d) try the whole word," (O'Connor et al., 2015, pp. 408-409)	Benedict et al. (2013) O'Connor et al. (2015) O'Connor et al. (2017)
DISSECT	Discover the Context. Isolate the Prefix. Separate the Suffix. Say the Stem. Examine the Stem. Check with Someone. Try the Dictionary.	Bryant et al. (2000) Lenz & Hughes (1990)
Flexible Strategy	"notice the vowels, find the syllables, read them, and put the parts together"	Vadasy, Sanders, & Peyton (2006, p. 368)
Spelling-Based Flexible Strategy	Read the word aloud. Explain the meaning. Orally divide word into syllables. Pronounce each syllable in the printed word while covering other part with thumb. Blend the syllables to say the whole word	Bhattacharya & Ehri (2004)
Peeling Off	Circle the prefixes and suffixes. Say the prefixes and suffixes. Say the root. Say the whole word.	Lovett et al. (2000) Lovett et al. (2017)
Overt Strategy	Circle the prefixes. Circle the suffixes. Underline the vowels. Say the parts of the word. Say the whole word. Make it a real word.	Archer, Gleason, & Vachon (2003)
Covert Strategy	Look for prefixes, suffixes, and vowels. Say the parts of the word. Say the whole word. Make it a real word.	Archer et al. (2003)

Together, these two principles can help students read long words. One way to implement this approach is to provide students with clear explanations of these two principles, provide multiple models of how these can be used flexibly, and provide extensive practice. Some strategies described in Table 3 directly include the ideas that every part must have a vowel and that every part must look OK. In other strategies, these ideas are implied, though not specifically identified for readers. Most of these approaches also include a focus on morphology, a point we will address later. These simple strategies can be effective for many students, although some may have difficulty deciding what "looks OK." This is one reason that extensive modeling and practice are so important.

Ms. Lyon decides to build on Nicholas's strength in reading monosyllabic words by teaching him to divide words into syllables. She chooses the BEST strategy, encouraging him to find the vowels in a word and break it into parts that look OK. He stops guessing on words like circus and tries to break up the words. However, he frequently chooses the wrong vowel sound.

Variable single-letter vowel pronunciations.

As stated previously, polysyllabic words are challenging because many of them have single-letter vowels that can represent at least three sounds: (a) the long sound, (b) the short sound, or (c) the schwa /ə/. It can be very hard to decide which to say. It is not surprising that Nicholas pronounced mason as mass-on.

The key is to help students understand that single-letter vowels can be pronounced with the long sound or the short sound. Students can practice saying both sounds for a vowel and practice reading syllables containing them. Figure 3 shows a simple activity in which students practice saying both sounds. Students who are learning polysyllabic word reading strategies probably know both sounds (otherwise they would be learning simpler strategies), but they may not be skilled in interchanging these pronunciations. Because this ability to

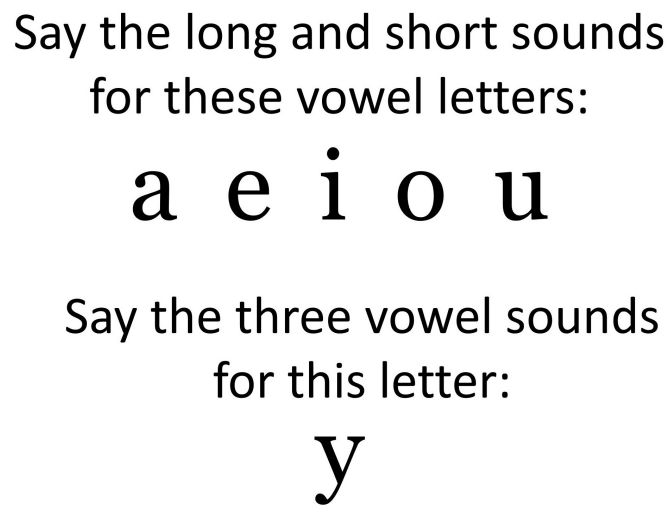

Figure 3: *Example of a simple activity to practice giving alternative pronunciations of the vowel letters when they appear alone. Y makes the vowel sounds long e, long i, and short i—, /i̬/ or /ē/, /ɑɪ/ or /ĭ/, and /ɪ/or /ĭ/. Students learn that y makes the consonant sound /j/ or /y/, but it is not practiced in this vowel-focused activity.*

flex the long and short pronunciations efficiently supports the ability to flex the pronunciations of written syllables, it is helpful even if students know both vowel sounds.

In some programs, students learn that single-letter vowels say their long sounds when they are at the end of a syllable and their short sounds in the beginning or middlefor example, in robot, the ro has the long sound and the bot the short (Cohen & Brady, 2011; Penney, 2002; Shefelbine, 1990). Students can practice reading syllables that end with vowels or consonants and pronounce the syllables with the correct vowel sound. A list of syllables an educator could use to practice syllable reading is contained in Table 4.

Other programs use a somewhat simpler approach. Students learn to try either the short or long sound for a single-letter vowel, regardless of how they divide it (Bhattacharya & Ehri, 2004; Lovett et al., 2017). Lovett and colleagues (2000) taught students to try the short sounds before the long sound, as the former is more frequent.

Because of Nicholas's difficulties with vowel sounds, Ms. Lyons decides to teach him both the long and short vowel sounds. She writes the vowel letters on cards and has him say both sounds. She has him practice reading syllables like mo. *She knows that this will help Nicholas try different options, but she also thinks he needs help thinking about what words he is reading.*

Flexibility and self-correcting mistakes.

Learning to use the long and short sounds as we just described helps students become flexible. However, it may not help when students sound out words and the result sounds strange. For example, the schwa /ə/ can change vowel pronunciations dramatically, especially textita and textito, where schwa (such as textita in textitamid or textito in textitmason) does not sound at all those letters' long or short sounds. Similarly, textita sometimes makes the short-*o* sound as in *water*, *i* can say the long-*e* sound like in *glorious*, and the letters *ow* can make the long *o* and *ou* diphthong as in *arrow* and *allow*. In these cases, knowing the options is not enough. Students need to combine flexibility with a strategic search for a real word.

When students sound out a polysyllabic word, they say the sounds and then blend them together, producing a spelling pronunciation (Elbro, de Jong, Houter, & Neilsen, 2012). For example, a student might sound out *stomach* as *stow-match—stow-match* is the spelling pronunciation. What readers need to do is to link the spelling pronunciation to a word in their mental lexicon—their internal dictionary of known spoken words (Kearns, Rogers, Al Ghanem, & Koriakin, 2016).

Students with dyslexia often struggle to make these connections because linking words to the lexicon requires them to do multiple sound manipulations, something that is quite difficult for these students. We have observed students say the sounds in *fan* but struggle to figure out what word it is—The *a* in *fan* has a nasal quality that the short *a* does not, and making that sound adjustment to locate the word is then challenging. To help, students should learn explicitly how to correct mispronunciations (Dyson, Best, Solity, & Hulme, 2017; Savage, Georgiou, Parrila, & Maiorino, 2018; see Ocal & Ehri, 2017, for an analogue in spelling). To learn this strategy, students listen to mispronunciations of common polysyllabic words (e.g., *mow-knee* for *money*) and correct them by saying the real word that sounds most similar to the mispronunciation.

Learning to link spelling pronunciations to words in the lexicon is very important for students with dyslexia. Students with dyslexia often know more spoken words than written words, meaning that they frequently encounter printed words they have heard before. As a result, they will benefit from opportunities to practice their polysyllabic word reading skills with words that are likely in the spoken lexicon. So, teachers should select words for reading practice that student with dyslexia would likely have heard before, though these would not need to be among the most common words. Students will need to know many less common words, so it is important to practice them too.

Moreover, teachers may sometimes include words

Figure 4: *A pipkin, an earthenware pot useful for medieval cooking but not good for reading practice. Credit: Andreas Franzkowiak, Halstenbek Germany.*

they think are totally unfamiliar to students. In these cases, we suggest that teachers begin their lessons by telling students how to say the words they will teach (without presenting them visually), giving brief definitions, and having students repeat the words aloud (Ouellette & Fraser, 2009). This way, the students will have some familiarity with the words that will help them make the link. It is also important that the words are not too familiar. If words are very high in frequency, students may have memorized their pronunciations and therefore rely on their knowledge of the whole word's pronunciation rather than practicing decoding them.

A final point about reading words is that some words are so rare that students may never encounter them in text—and their teachers may not even know them. For example, at least one program for students with dyslexia includes the word *pipkin* as a real word for students to practice. A pipkin (Figure 4) is an earthenware pot, but few students—and we suspect few readers of this article—will know the meaning; moreover, students (and their teachers) may never this word in text. As a result, it seems odd to treat this as a real word. We recommend that educators avoid including *pipkin*-type words when they do real-word practice. If such words appear in otherwise-well-designed programs, we recommend replacing them with real words students may hear.

Students can also benefit from practice reading words that are definitely not part of the spoken lexicon, as students will also encounter more of these words as they read more advanced texts. Therefore, some practice with unknown words—even made-up words called nonsense words—may be appropriate. When students read nonsense words, it can help students learn to make their pronunciations more fluid and natural, particularly by using appropriate stress patterns (Heggie & Wade-Woolley, 2017). If a student says "zay-pell" for the nonsense word *zapel*, the student is stressing both syllables; that is not correct. In real words, we would say "zuh-pell" or "zay-puhl," like *lapel* or *label*. We offer two cautionary points for having students practice reading nonsense words. First, students should always have practice reading real words. In addition, we suggest avoiding nonsense words with students who are learning English, particularly those at lower proficiency levels, because they should be learning words they can add to their mental dictionaries.

We also want to make clear that linking spelling-pronunciations to real words is not the same as teaching students to use context when they are reading unknown words in real texts. There are several reasons for this. First, good readers do not use context as a decoding strategy (Share, 1995; Stanovich, 1986). Second, the most powerful tool students have for saying a correct word is letters themselves. If we organize the Treasure Hunt well, students will trust that the letters will help them—and the letters are the key to pronouncing the word. Third, context is frequently unhelpful (Share, 1995). Finally, focusing on context for word reading commits too much higher-order cognitive processing to saying the word. The mispronunciation correction strategy is designed to help students quickly access the part of the brain that says, "Yes, that is a word," not to access the complete meaning as it would fit in the sentence. Instead, we want students to reserve their cognitive energy for understanding the text's meaning.

Ms. Lyon knows that Nicholas will benefit from practice linking his spelling-pronunciations to the lexicon. She makes sure to include words he should have heard at least once or twice and has him repeat the words before they practice. To practice mispronunciations, she makes mispronunciation correction an activity in every lesson. She reads a section of words like a struggling reader might, producing a labored incorrect spelling pronunciation. Nicholas is given the role of the teacher and corrects each mistake by saying the real word.

Morphological Knowledge

Morphemes can provide great benefits for students with dyslexia; knowledge of morphemes can help students break long words into much smaller parts. In Figure 5, we illustrate how two 12-syllable words are easier or harder to read depending on the number of morphemes they have. Clearly, breaking words into meaningful parts makes it easier to read them. Table 1 illustrates that Nicholas does not recognize base words or

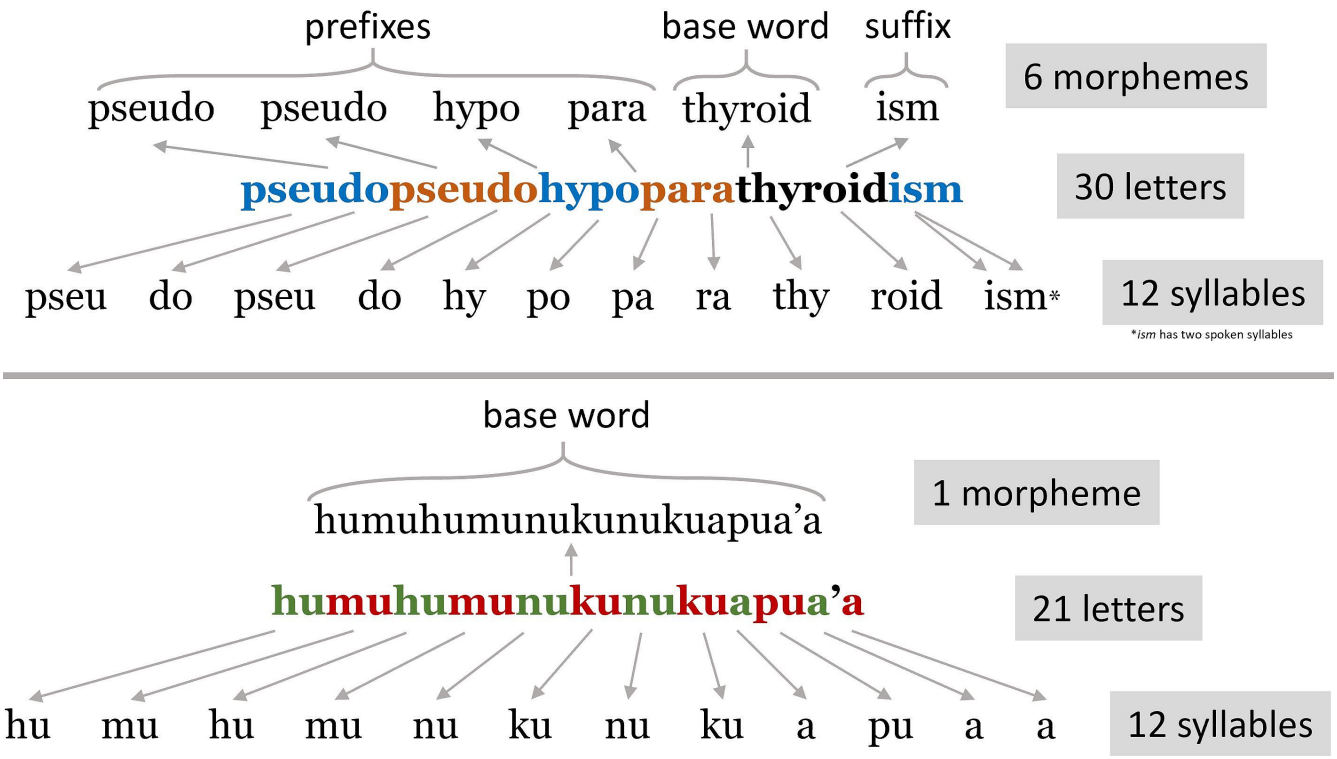

Figure 5: *Two words with different structures, both with 12 syllables. Try reading both. Which is easier to read? For us, it is the top word. We recognize the morphemes and can easily read the word by pronouncing the morphemes. The 12 syllables become just 6 parts, 4 prefixes, a base word, and a suffix. For the bottom word, we are stuck with the 12 individual syllables. You may notice that it contains humu twice and nuku twice, but it is much harder to spot this pattern than the morphemes in the top word. This is because humu and nuku are not morphemes we have seen before. The top word is a rare disease that share some characteristics with pseudohypoparathyroidism, which is, in turn, a disease that shares some characteristics of hypoparathyroidism. The bottom word refers to the state fish of Hawai'i. It is also known as a reef triggerfish. Both words are known primarily for being long words.*

affixes when he readsHe sees neither *beauty* (the base word) nor *-ful* (the suffix) in *beautiful*.

Morphemes are helpful for two reasons. First, they are frequent word parts that are usually longer than graphemes, as Figure 5 shows. When students divide words using morphemes, there are fewer parts than with graphemes. This makes decoding easier. Thus, morphemes are helpful for readingand also for spelling. Second, morphemes have their own meanings that can help students understand vocabulary and thus better comprehend texts. Data indicate that teaching students to identify and manipulate morphemes, to change the pronunciation and meaning of words can improve vocabulary and reading comprehension (Goodwin & Ahn, 2013). Our focus is on the value of morphemes for pronunciation, but the data make it obvious that learning morphemes also supports learning meaning.

Learning the spellings and pronunciations of affixes.

Many English words contain affixes, prefixes or suffixes. There are two types, inflections and derivations. Inflections are mostly very simple changes to words that usually indicate number or tense but do not change the meaning or part of speech of a word. The most common inflections are *s* (added to verbs to match singular subjects and added to nouns to make them plural) and *ed* and *ing* (as verb endings that indicate tense). These are very frequent, even in texts for students in the primary grades, so students with dyslexia should learn them early in their reading instruction.

Inflections may be more challenging than they first appearbecause the pronunciation of letters in the affix may not be the same as when the letter is used to spell other words. For example, the *s* plural inflection makes the usual /s/ sound in *cats*, but it is /z/ in *dogs*. Similarly, the *ed* past tense inflection is /d/ in *meowed* but /t/ in *barked* and sounds like *Ed* in *shouted*. There is a logic

to these pronunciation differences, but it is complicated. Some programs include instruction to help students understand this logic, but we do not think this is needed for two reasons. First, people are quite used to adjusting /s/ to /z/ and /d/ to /t/ when speaking, even with previously unknown words. The verbs *Skype*, *Google*, and *text* are relatively new, but most readers will pronounce the *ed* in *Skyped*, *Googled*, and *texted* with /t/, /d/, and /ɪd/ as they should. Students with dyslexia may have more difficulty making these adjustments than other students, but the solution is not to teach a complex set of rules for deciding which pronunciation is right. Rather, students should learn the different pronunciations and have opportunities to practice reading words with them—and when they are incorrect, they can fix their spelling pronunciations (Vadasy, Sanders, and Peyton, 2006).

A second category of morpheme is the derivational affix. These differ from inflections in that they change the meaning of the word. Prefixes have this effect. The prefix *un-* turns a verb into its opposite, and *re-* indicates something is done repeatedly (*reread*) or done over (*retake*). Suffixes change a word's part of speech and may have additional effects on meaning. The suffix *ness* makes an adjective into a verb and indicates a state of having the adjective's qualities. *Openness* indicates that someone has the quality of welcoming new ideas, i.e., is open.

To help students learn derivational affixes, the students must first memorize the spellings and pronunciations of the affixes through repeated practice (see Table 5 for a list of affixes for educators to teach). It is also important that students know whether the affixes are prefixes or suffixes so they know where to look for them in a word. For example, Lovett and colleagues (2000, 2017) designed a wall of affixes that students learn one-by-one and regularly practice so that the students memorize the spelling and pronunciation of the affixes.

Locating affixes and using them to decode words. The second important strategy is to teach students to separate words into parts by affix. After students have located the affixes, they can focus on reading the base word using the strategies in the previous section. Once they know the base word, the reader can reassemble the word by morpheme and read it fluently.

The strategy to find and separate affixes in long words is part of almost all of the strategies shown in Table 3. We particularly like the term Lovett et al. (2017) use, "Peeling Off." To master Peeling Off, students learn the spelling and pronunciation of affixes. Then, when they read words with morphemes, students circle the affixes in this word, pronounce each affix in isolation, read the base word (sometimes called a root; see Table 2 for the distinction between these terms) using other strategies, then put the parts together to read the whole word. Stu-

Table 4: *Common Syllables Useful for Instruction*

Syll.	Words	Frequency	Example
ter	213	41,840	interviewed
ex	171	12,760	Excellency
com	151	10,024	commenced
ty	131	10,143	property
ble	119	9,173	nibble
di	99	6,412	radiator
ry	94	22,072	furry
an	84	31,098	anguish
der	82	11,727	wonderful
ver	78	26,801	overly
to	71	32,970	motto
ta	71	5,692	adaptation
ma	70	6,860	maple
im	67	6,261	immortal
pa	53	6,526	patriotism
im	67	6,261	immortal
ten	51	7,605	rotten
ber	41	5,818	berry
ny	37	5,577	puny
ven	36	8,389	convention
son	34	5,122	garrison
ture	34	5,598	vulture
tle	32	15,576	rattle
fer	30	6,180	fertilized
fa	27	8,311	fables
ple	23	21,883	simple
af	21	11,913	affected
ent	21	6,054	presently
wa	20	10,942	wavered

Table 5: *Most Frequent English Morphemes*

Prefixes	Suffixes	Root Words
un	s	out
in	ing	up
dis	ed	way
en	er	direct
over	ly	in
re	ion	side
under	y	line
fore	al	work
a	ation	act
mis	ive	light
pre	or	land
trans	ity	time
sub	ment	use
inter	able	water
mid	ness	hard
non	en	day
counter	ful	air
hydro	est	draw
be	less	set
semi	ous	place

dents practice reading the individual affixes in isolation daily and then immediately practice Peeling Off.

DISSECT and BEST have much in common with Peeling Off. Archer, Gleason, and Vachon (2003) also included two different ways of using affixes to decode words, one called the Overt Strategy and one the Covert Strategy. The Overt Strategy includes identification of vowel letters that mirrors the ESHALOV strategy that O'Connor and colleagues (2015) paired with BEST. The Covert Strategy functions on the assumption that students already recognize how vowel letters relate to syllables and emphasizes the use of affixes. The idea of the Covert Strategy is that it provides a technique that will work efficiently during text reading. In Figure 6, we provide an example how a student would combine information from a strategy like BEST with knowledge of morphology and flexibility in pronunciation.

It is important to stress that these strategies require students to connect their spelling pronunciations to their lexicon. Most of them make this explicit: Archer et al.'s (2003) Covert and Overt Strategies specify that the final step is to "make it a real word." BEST's final step is to "try the word," implying trying to find a real word like it. This step also implies that students will need to be flexible when they use affixes to decode words. Many derivational affixes change the spelling of the base word, its pronunciation, or both: rely to reliable, courage to courageous, or nature to natural. Of course, it is important to introduce these complexities slowly, in the tradition of the Treasure Hunt. So, students should first learn to use affixes with words that make no changes in spelling or pronunciation of the base word.

Learning base-word families.

In addition to learning affixes, students can benefit from practice reading base-word families. English has sets of words that all contain the same base word with one or more affixes added to it. One valuable activity can be to have students practice reading sets of words that all have the same base word. Base-word family reading works best after students have learned a large group of affixes and learned how to be flexible with them. This is because many base words change based on the addition of affixes (like *nation* to *national*).

You will notice that we have not included much information about teaching the meanings of affixes and base words. Although studies show that talking about the meanings of morphemes can improve vocabulary and comprehension skill (Goodwin & Ahn, 2013), they do not show similar effects in improving word reading. As a result, it is helpful to talk with students about the meanings of affixes and base words, but not necessary if the sole objective is to improve word reading skills. In addition, for affixes, teaching students the exact definitions may not help.

For example, the suffix *tion* means "the act of," but this will make little sense to most students with dyslexia. A better alternative is to have students read sentences and passages including words with these affixes to discuss the meanings of the words as they fit into the sentence. For example, *-ly* means "in that way" and makes adjectives adverbs, so *carefully* means "in a careful way." It would help students to give them sentences like, "The baker carefully removed the pie from the oven" and talk about the meaning of *carefully*, like, "When it says that the baker removed it carefully, she took it out really slowly and gently because it was hot." Discussing words with the suffix *ly* in this way will help more than teaching the definition and repeatedly applying it to words.

Another topic that we have not addressed is whether teachers should talk about roots. Roots are bound morphemes that cannot be used without an affix. The root *vis* concerns things seen, but *vis* is not a word. There have been some recommendations to teach about roots and their relationships with affixesinstruction sometimes called word analysis. A word analysis unit with the root vis may introduce it with words such as *vision* or *revise*. For word reading, it can be helpful to teach roots as sound-spellings. There are data suggesting that learning about roots facilitates vocabulary development (Crosson, McKeown, Moore, & Ye, 2018), but few studies clearly indicate whether word analysis improves for pronunciation. This strategy may have benefits, but we

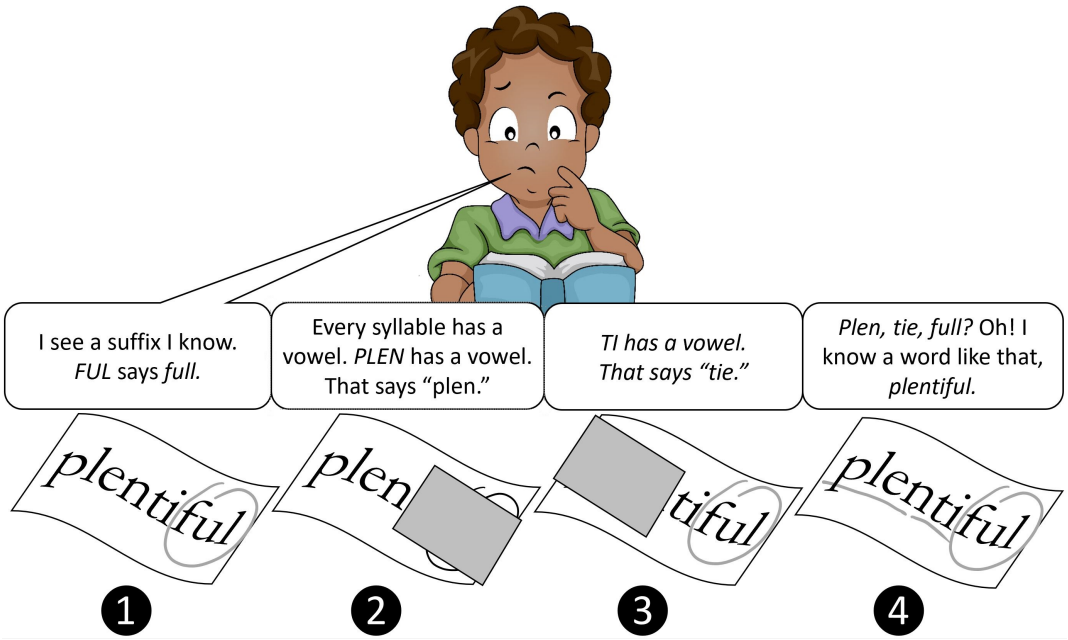

Figure 6: *Steps a student uses to decode an unfamiliar word, plentiful. In (1), the student locates a known suffix, -ful. In (2), the student applies the ESHALOV ("every syllable has at least one vowel") principle to pronounce the first part, plen. The student could also have identified plent which also has one vowel. In (3), the student examines the second part that follows ESHALOV, ti. The student mispronounces it, saying it like tie. This is a reasonable pronunciation for the letter I. In (4), the student realizes that might be a word he has heard beforebut never read. Put in more technical terms, the student locates the target word in the spoken lexicon. The student then gives the correct pronunciation.*

think the data are insufficient to make a recommendation whether roots should be part of instruction focused on the pronunciation of polysyllabic words.

Ms. Lyon decides that what Nicholas really needs is practice with morphemes. She begins with the most common prefixes and suffixes and teaches him to identify them and peel them off words. He creates an affix dictionary to track prefixes and suffixes he has learned and practices reading them before his word reading intervention practices. Using affixes, he is able to read longer and longer words. While he still slows down somewhat, he is making fewer and fewer errors in his reading and has almost completely stopped saying "I don't know."

Practice

We will close with what is perhaps the most important principle for teaching polysyllabic word reading: Have students practice as much as possible. There are several ways to increase practice. One is to provide more time for word recognition instruction. Another is to increase the number of words students practice. Teachers can estimate how much word reading practice students are getting by counting how many times in a minute a student directly reads a word (not counting times where the student follows along as classmates read). If a student reads one word or less in a minute, practice is limited. When students are learning strategies for the first time, their practice might be somewhat limited, but when they begin practicing, teachers need to maximize the number of opportunities each student has to read aloud.

One consequence of this principle is that simpler strategies are probably preferable to those that involve more time to execute. While each of the strategies described in Table 3 provides an approach to syllable division, some of these approaches have more steps than others and we encourage teachers to use the simplest approach they find effective for their students. Our rationale is that complex strategies involve too much high-level cognitive effort and distract attention from processing text meaning. In addition, students are much less likely to apply a complex strategy than a simple one when they are reading independently. That said, there are some explicit strategies high-effort strategies like syllable division that have been used in some programs for students with dyslexia (e.g., Orton-Gillingham). The use of such a strategy might benefit some students (see Knight-McKenna, 2008, for details; cf. Diliberto, Beattie, Flowers, & Algozzine, 2008; Kearns and Al Ghanem, under review). For some students, an explicit strategy could provide a helpful temporary solution that a more flexible strategy might eventually supersede.

Even with simple strategies, the key to acquisition is

extensive practice. Students with dyslexia often require more practice to master skills than their peers with typical achievement (Guskey, 2008). Catching up using the techniques in this paper will require many chances to apply them in texts. This means that teachers must prioritize opportunities to practice above many other things, including explaining concepts in great detail. One way to decide whether there is enough practice is for teachers count how many times a student read a word in a minute. This would not include times when another student reads because many students with dyslexia lose focus when others practice (this is one reason round-robin or popcorn reading is a bad idea). It would also not include silent reading because students with dyslexia have often become expert at pretending to read. If that minute contained no chances for that student to read aloud, there might not have been any learning in that time.

It may seem overwhelming to achieve adequate practice with one teacher and multiple students in a resource room or co-taught class, but the teacher does not need to manage it all. Students with dyslexia can work with peers at the same ability level or with better reading skills. Peer-mediated reading practice can increase the reading achievement of students with learning disabilities including dyslexia (e.g., Fuchs, Fuchs, Mathes, & Simmons, 1997).

Whether it is under the teacher's supervision or with peer support, practice that supports the other strategies we have discussed is essential. Teachers must design lessons to help students with dyslexia use these strategies and follow these with extensive practice that gives every student many opportunities to use the strategies themselves. This will have the greatest impact on their ability to read polysyllabic wordsand succeed in reading in general.

Summary

Ms. Lyon prepares Nicholas for an upcoming science lesson in his inclusive science class. She pronounces the words the words he will encounter in the text, and he repeats them. Then, he practices reading them on his own to prepare for his science lesson with Ms. Lyon. She provided him with a copy of the text and a list of words to practice the day before. She watches with pride as he looks at the word organism, identifies the suffix ism, reads the base word organ by dividing it into syllables, and pronounces it. For invasive, he first tries the short a *but corrects it to long* a. *She provides him the pronunciation for species then helps him map the syllables in the print, then practice the word again. Before the end of the class, he reads the passage, confidently pronouncing each word.*

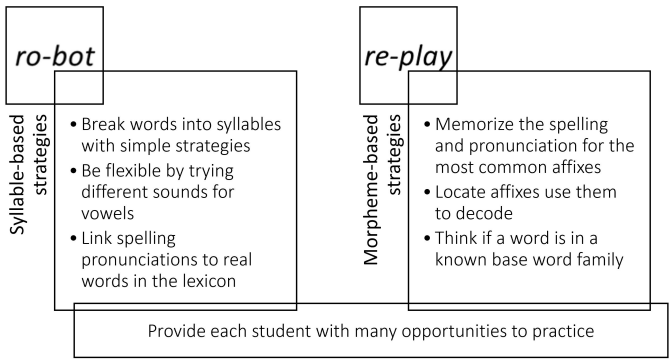

Figure 7: *A representation of the syllabic and morphological strategies used to teach students like Nicholas to read polysyllabic words. Throughout, students should have many opportunities to practice reading words in isolation and in texts.*

The strategies students like Nicholas use to read polysyllabic words are not the same ones they used to learn monosyllabic words. The Treasure Hunt gets harder once students reach the later stages. By the time students reach upper elementary school, the vast majority of words are polysyllabic (Kearns, 2015) and seem difficult to read. Students with dyslexia can get frustrated and give up or guess. However, a few simple strategies can make even the longest words manageable. Figure 7 briefly summarizes the strategies described in this article.

Students can learn simple strategies to divide words into syllables and pronounce vowels flexibly and then strategies to identify and read affixes and base words. With sufficient practice, these strategies can become automatic and students can become fluent readers.

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