

# The Science of Reading: An Introduction to Research-Backed Instruction



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# Introduction

If you've spent some time reading about the state of reading instruction in American classrooms, you could be forgiven for thinking that nothing poses as much of a threat to children developing a love of reading as phonics. Endless, rote drills, boring flashcards, and dry exercises detached from "authentic texts" all conspire to turn children against the written word—or so the narrative goes. In reality, however, not only is this a hugely distorted picture of what phonics involves, but the situation is exactly the opposite: **many children fail to develop a love of reading because they do not really learn to read.**

Before going any further, I'd like to insist on the importance of distinguishing between short-term and long-term thinking. Yes, it is reasonably straightforward to design activities around simple picture books that keep young children engaged and excited. And yes, there is no denying that some popular strategies for teaching reading can and often do produce something that looks like proficiency. Many children successfully memorize numerous words by sight, and some of them become highly intuitive and skilled guessers as well. In the early grades, children with poor phonetic understanding may actually read above grade level. Given that, it might seem pointless to make a fuss over how children are reading the words—why should it matter as long as they can read them?

The answer is that **enthusiasm and workaround strategies such as memorizing and skipping and guessing can only take the place of fundamental skills for so long.** The emphasis of much early-reading instruction is on getting students to read on grade level, without much consideration of what happens afterward. A child might memorize enough words by sight to eke into the realm of proficiency in first or second or even third grade, but what happens after that, when suddenly there is a flood of new words to contend with? A child can read "just right" books for only so many years before it becomes clear that they are not going to naturally catch themselves up, and any remediation beyond the early grades is likely to be complicated by the psychological roadblocks of shame and low self-esteem. Once children have developed an image of themselves as "bad readers," it can be very difficult to shake.

To be clear, around 40% of children will pick up much of the reading "code" with no or minimal instruction, and those who do not may be taught by a parent or tutor and become skilled and avid readers. However, for the larger group of students who require some degree of systematic, explicit teaching, and who are unable to access it outside of school, the results are at best years of frustrating plodding through impenetrable mounds of text, and at worst nothing short of tragic. (California is notorious for having used fourth-grade reading scores to estimate the size of its future prison population.) Because the consequences for disadvantaged students are so dire, discussions about the long-term fallout of poor reading instruction tend to focus on them; it is often assumed that students from more affluent families are unaffected. In the years I spent tutoring mostly very well-off teenagers, however, I saw very clearly that that was not the case.

Not only were many of my (SAT®) students unable to sound out unfamiliar words, but it did not even seem to occur them that words could be sounded out. They guessed wildly, they misread words, they confused similar-looking words, they added letters, they skipped letters, they skipped words, they skipped entire *lines*, often without seeming to realize it. In some cases they even struggled to read in a normal left-to-right sequence for a sustained period. These were high school juniors, but they were often reading (and writing) at a middle-school level. Yet somehow they had skated through until eleventh grade—at supposedly very good schools—without anyone intervening, or even noticing. I was flabbergasted.

It took me nearly a decade to fully understand the system that had produced these kinds of reading problems, and the more research I did, the more I became aware of the extraordinary split between the scientific and educational communities, and of how much critical information about how the reading process occurs—information that should play a key role in shaping pedagogy—is far from common knowledge. Indeed, the information in this guide was compiled over many months and from a diverse array of articles, research papers, published interviews, and personal conversations. I have done my best to distill the key points from these very disparate sources into as concise and coherent a form as possible.

**That said, the bottom line is this: beginners and experts approach any skill in fundamentally different ways, and reading is no exception. Any reading program that fails to acknowledge that reality is bound to fall short.**

Skilled readers can devote all their energy to thinking about meaning because for them, decoding is an effortless process in which sound-letter combinations are retrieved from memory and strung together automatically. To reach that stage, however, most children must pass through an initial, often extended period in which learning to match sounds and letters is the main focus. Asking them to skip that step—or learn in a way that downplays its importance—deprives them of the opportunity to acquire a solid foundation. And that is a shame because most children are thrilled to discover that reading is a code and that they can break it.

It is also important to remember that children's understanding of spoken language generally far exceeds their decoding ability, and that books for young children rely on very simple words. Consequently, beginning readers do not need to be taught detailed comprehension strategies—if they can decode a text fluently, they can probably understand it. As letter-sound associations become fixed in children's memories, they will recognize words more quickly, become more confident as readers, and have more bandwidth available to process meaning, allowing them to explore more challenging texts. In the meantime, adults can address the other side of the reading equation by developing children's vocabulary and general knowledge by reading more challenging texts aloud and discussing a wide range of topics. Eventually, the two pieces will merge, allowing students to access the full power of the printed word.

—Erica Meltzer

# I. Written English Is a Code

- Letters and combinations of letters represent sounds. “Decoding” literally means “undoing the code.”
- Letters and letter-combinations in all parts of a word contribute to its sound

Unlike Spanish or Italian or German, English is **not perfectly phonetic**—certain letters or groups of letters are pronounced differently in different contexts.

However, English is also **not a pictographic language** like Chinese, in which characters stand for entire words and must be memorized individually.

**While English has far more exceptions than other European languages, the vast majority of its words can still be read more or less phonetically.**

- More than 85% of English words are either completely regular (50%) or very slightly irregular (35%, usually one vowel sound).
- Another 10% or so are moderately irregular but follow alternate patterns (again mostly involving vowels).
- Less than 5% are completely irregular and must be learned by sight.

English is irregular because it is a **hybrid language**: part Anglo-Saxon (Germanic) and part Latin (often via French), with a sprinkling of Greek. Latin-derived terms, which tend toward phonetic spellings, tend to be more formal and technical, whereas the Anglo-Saxon-derived terms that predominate in everyday speech tend to be less phonetic. **As a result, English spelling is often considered less predictable than it actually is.**

## II. Reading Is a Learned Skill

Unlike spoken language, writing was invented only about 5,000 years ago.

Although children cannot learn to read until all the relevant regions of the brain are sufficiently developed, there is no developmental stage when they automatically acquire the ability to understand print.

While a small percentage of children will learn to read on their own, **the vast majority (around 95%) require some degree of explicit instruction.**

~5% read effortlessly.

~35% need minimal instruction.

~40-50% need explicit, systematic instruction.

~10-15% require extended systematic instruction, with significant repetition.

Learning to read phonetically can help virtually all children become better readers, writers and spellers in the long term by given them the tools to manipulate the building blocks of written language.

- It reinforces the connections between speech, letters, and sounds.
- It builds speed and automaticity.
- It ensures that "natural" readers do not miss key skills.

### III. What Does It Mean to "Read"?

Discussions about reading are often filled with misunderstandings because the term is used to refer to two separate actions with very different meanings.

#### 1) Decoding

The act of matching sounds to letters (or groups of letters) in order to sound out words.

#### 2) Comprehension

This ability is much more complex, requiring the integration of syntax (word order), vocabulary, and background knowledge.

**Decoding ability is necessary but not sufficient.** It is impossible to understand the meaning of a text unless you can figure out what the words say; however, knowing what the words say does not guarantee that you will understand their meaning.

Most adults, for example, could decode an advanced physics textbook fluently, but would understand next to nothing. This does not mean that learning to decode is optional, however, or that it is just one skill among many. Rather, it is the basis for understanding written language. At the same time, other factors—some quite complex—are also involved.

**Learning to decode phonetically will not necessarily turn a child into a stellar reader, but not knowing how to decode this way will make it unnecessarily difficult for them to read well beyond a certain level.**

## The Simple View

### Reading = Aural Comprehension x Decoding Ability

In other words, a person's ability to read cannot exceed their aural comprehension (which includes vocabulary, syntax, and background knowledge) or their understanding of sound-letter correspondences.

- Described in a 1986 paper by Philip Gough and William Tunmer; among researchers, accepted general theory of how reading works.
- Reading difficulties can be caused by a weakness in one area or, more often, both ("garden-variety" reading disability).
- Because reading is the product rather than the sum of two components, it cannot occur if either is missing entirely. (Anything multiplied by zero is zero.)  
A student who cannot decode cannot read, regardless of their other skills.

Until late middle school, children can generally understand spoken language more sophisticated than what they can decode. The goal of reading instruction is to bring their print comprehension up to the level of their aural comprehension.

### The 5 Components of Reading

- 1) Phonemic Awareness
- 2) Phonics
- 3) Fluency
- 4) Vocabulary
- 5) Comprehension



## Orthographic Mapping

Expert readers process words automatically and effortlessly as a result of a process called **orthographic mapping**. (*Orthography* means "spelling.")

Essentially, **words and sounds are wired together in their memories**; their brains have mapped specific sequences of letters as corresponding to specific sequences of sounds, and stored the information for instant recognition and retrieval. As a result, the vast majority of words are effectively "sight words," freeing them to focus on meaning.

**Orthographic mapping is fundamentally different from memorizing whole words visually.** That method involves sight only and requires each new word be learned from scratch rather than matched to existing sound-letter relationships.

To reiterate: students who read by memorizing words by their appearance may seem to be on track for several years but develop problems later, when their working memories become overwhelmed.

### Orthographic mapping is NOT the result of:

- Memorizing an entire text and reciting it while looking at the page(s)
- Guessing based on pictures
- Guessing words based on the first/last letters, or on "little" words contained in a longer word
- Guessing or making words up based on "what would make sense"
- Guessing based on other context clues

## What Is Synthetic Phonics?

Like the word *reading* itself, the term *synthetic* is cursed with two meanings that add to much of the confusion in discussions about phonics.

On one hand, it is most commonly used as a synonym for *fake*. Interpreted this way, the name "synthetic phonics" is often—and incorrectly—assumed to refer to the fact that phonics programs may require children to read nonsense words as well as real words. This fact is often used as grounds to criticize phonics programs as being divorced from "authentic" reading, or for failing to encourage children to focus on "making meaning."

**In reality, however, *synthetic* comes from the word *synthesis*: it refers to the fact that such phonics programs are based on teaching children the building blocks of written language and then helping them put the blocks together, or *synthesize* them, into words.**

Synthetic phonics facilitates orthographic mapping by explicitly and systematically teaching relationships between writing and speech. When children's brains process sound-spelling relationships efficiently, they can turn new words into sight words after only a few exposures.

**To be perfectly clear: The goal of synthetic phonics is to get children reading real books as quickly as possible (when they have learned around 6-8 sound-letter combinations), not to provide endless isolated drills.** It does, however, rely on **decodable readers** that are assigned based on the sound-letter combinations that children have already learned, allowing them to practice applying skills in a non-overwhelming way. Early success with these books builds confidence and reinforces the idea that new words can be figured out logically. At the same time, adults can read more challenging texts aloud.

## IV. Why Is the Three-Cueing System (MSV) Ineffective?

As a truce in the reading wars of the 1980s and 90s, many schools implemented a program known as "Balanced Literacy," in which phonetic instruction would be balanced with more general literacy-building activities such as read-alouds. In reality, however, Balanced Literacy is often used as a cover for reading taught via Whole-Language or the **three-cueing system** (or MSV), in which children are taught to read by using orthographic (spelling), syntactic (word-order), and meaning-based clues.

Children taught this way are typically required to memorize many common words by sight, then taught to use first letters (and sometimes last) letters and sounds, along with a variety of contextual information, including pictures, to identify unfamiliar words. Teachers may keep a running record of students' reading errors ("miscues") for analysis but typically address such issues from the standpoint of meaning rather than phonetic understanding.

The essential problem with the three-cueing approach is that it encourages compensation strategies (guessing, memorizing, skipping) that weak readers use, with the result that children often become weak readers. **Establishing the sound-letter correspondences that underpin skilled reading requires close and continued attention to how words are written, whereas three-cueing methods encourage children to ignore specific sequences of letters and guess. The two approaches are incompatible.**

Even if phonics is presented as an option, some children—particularly ones with weaker skills—will realize that using pictures or other clues requires far less effort than sounding words out and fall further behind.

**To be clear: skilled readers DO use context clues all the time, but as an aid to understanding meaning.** Children who decode well may also use them occasionally to help identify irregularly pronounced words, but this is different from relying on them because of an inability to decode phonetically.

## Additional Problems with Three-Cueing Methods

- Reliance on pictures leads to difficulties with text-only books.
- Repeated checking to see whether guesses make sense impedes speed and fluency.
- Multiple words may make sense in context.
- Context clues may be ambiguous or absent.
- Context clues themselves may be misunderstood.
- Difficulty monitoring comprehension (children may not realize when they are misreading words).
- Difficulty reading proper names (including places) and subject-specific terms, which often cannot be determined from context clues; this can become a very serious problem in later grades.
- Lack of knowledge transfer: a word identified only from context in one situation may not be recognized in a different situation.
- Long-term inability to focus on words in normal left-right sequence (eyes racing around the page).
- Increase in speed accompanied by decrease in accuracy.

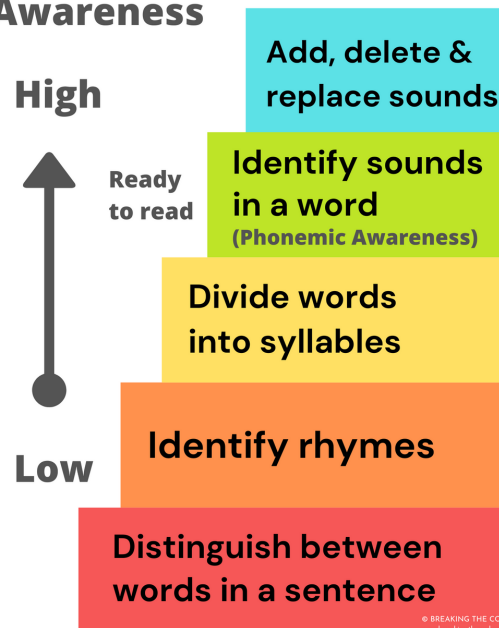
## V. Phonological and Phonemic Awareness

**Phonological awareness** is the ability to recognize and distinguish between sounds in a language. This skill has multiple levels, ranging from very basic (differentiate between words in a sentence) to advanced (add, delete, and replace sounds within a word).

**The most important aspect of phonological awareness for beginning readers is phonemic awareness, or the ability to identify individual sounds within a word.**

Although many children develop lower levels of phonological awareness well before they begin learning to sound out words, the relationship between these two abilities is not always linear. While very basic skills such as distinguishing between words in a sentence must obviously be mastered before reading instruction begins, other, more advanced skills may be acquired at a later time.

### Levels of Phonological Awareness



For example, some children who cannot easily break longer (spoken) words down into syllables may nevertheless learn to sound out single-syllable words without too much difficulty, later building to multi-syllable ones.

Likewise, a child who has difficulty identifying rhymes is likely to improve this skill as a result of having their phonemic awareness developed, even though the latter is technically a higher-level skill.

For older struggling readers for whom it is not practical to focus exclusively on aural-only skills, development of phonemic awareness should be integrated into a general phonics (word-sound relationship) program.

# Phonemes

**Phonemes** are the individual sounds that make up a word.

There are 26 letters in the alphabet but **44 common phonemes** (chart on p. 14).

A phoneme can be made up either of one letter, or of multiple letters.

- The word **pin** contains **three phonemes**, each represented by a single letter: p/i/n.
- The word **sigh** contains **two phonemes** (s/igh), even though it has four letters.
- The word **chin** contains **three phonemes** (ch/i/n), even though it has four letters. The same is true for *sing* (s/i/ng).
- The word **brick** contains **four phonemes** (b/r/i/k), even though it has five letters.

The number of phonemes can also differ from the number of syllables.

- The word **l** contains one syllable and **one phoneme**.
- The word **cat** contains one syllable and **three phonemes** (c/a/t).
- The word **pens** contains one syllable and **four phonemes** (p/e/n/s).
- The word **over** contains two syllables and **three phonemes** (o/v/er).

**Phonemic awareness** is the ability to isolate the phonemes in a word.

Phonemic awareness not a "natural" skill—it is important only insofar as it prepares children to read and write—but is absolutely crucial. It is impossible to connect sounds to letters unless the sounds can be heard correctly in the first place. As a result, **phonemic awareness essentially predicts skill in reading.**

Phonemic awareness is often underdeveloped in children who have not had their language skills developed through activities such as reciting the alphabet, playing with rhymes and sounds, etc.

Difficulty identifying and discriminating between similar vowel sounds (e.g., "eh" and "ih") is often the primary issue. The developing brain has a "window" between approximately six and 18 months to learn to hear and differentiate these sounds; if a child receives insufficient exposure to them during this period, for example because their primary caregiver speaks with an accent, they may permanently struggle to identify them. **This is not a hearing problem but rather a matter of how the brain processes aural information.**

## The Unnecessary Schwa

A rampant problem in phonics instruction involves the insertion of a schwa (a neutral "uh" sound) after a consonant. For example, *cat* is frequently broken down as *cuh/a/tuh*. This is incredibly confusing to some children, who do not intuitively grasp that the extra vowel sound must be omitted when the sounds are blended together.

To avoid this issue, consonants should be pronounced unvoiced—that is, without engaging the vocal cords. For example, an unvoiced "s" is the first sound in the word *snake*: it consists of the only the consonant sound and a stream of air.

Note: for ease of blending, you may find it helpful to pronounce "w" as *woo* and "y" as *yee*; these sounds cannot really be said unvoiced.

# The 44 Main English Phonemes

**b - boy**

**g - go**

**m - my**

**qu - quit**

**v - van**

**z - zebra**

**th - that**

**aw - paw**

**eh - ten**

**ih - win**

**or - for**

**c/k - cat**

**h- hat**

**n - not**

**r - red**

**w - wet**

**ch - chip**

**a - apple**

**ay - pay**

**er - cover**

**oa - boat**

**ou - loud**

**d - dog**

**j - job**

**ng- ring**

**s - sun**

**x - fix**

**sh\* - shop**

**air - fair**

**eer - cheer**

**ew - few**

(long)  
**oo - food**

**oy - boy**

**f - fit**

**l - late**

**p - pet**

**t - tip**

**y - yes**

**th\*\* - thin**

**ar - far**

**ee - feet**

**ie - tie**

(short)  
**oo - took**

**uh - cup**

\*An alternate phoneme, zh, is used in words ending in *-sion*, e.g., *confusion*, *illusion*, *revision*.

\*\*A voiced version of this phoneme is used in a small number of words, e.g., *though* and *that*.



## Building Phonemic Awareness: Manipulating Sounds

**Blending** and **segmenting** are aural/oral exercises designed to help children understand how words are made up of smaller components: phonemes and syllables. (A syllable can consist of a vowel alone, or of a vowel + consonant(s), but it cannot consist of only consonants.)

In blending, children begin with sounds and put them together to create words: typically, the instructor speaks the syllables or phonemes in a word slowly and then has the child (or children) "blend" them quickly together (e.g., ch-air: chair).

in segmenting, they begin with whole words and break them into their component sounds. In one common exercise, the instructor says a word and then has the child repeat it, clapping for each syllable (e.g., pencil: pen-cil) and then saying the number of syllables. Alternately, the instructor may give the child a word to "stretch" by saying each phoneme slowly (e.g., team: t/ea/m).

Because blending builds more directly on spoken language, whereas segmenting is essentially preparation for writing, blending exercises should normally be introduced first.

A more advanced exercise involves **replacing (adding and subtracting) sounds**. For example, the instructor says the word *bat* and has the child repeat it. The instructor then asks the child to take off the "b" and say the sound that remains (*at*), after which the child is asked to add an "m" sound to the beginning of the word (*mat*). Next, the instructor asks the child to remove the "m" and replace it with an "s" (or any other consonant), and so on. Although this may seem like a simple exercise to most adults, it actually requires a fairly sophisticated level of aural processing.

You can also present children with pairs of words and ask them whether they rhyme. The ability to hear endings as "chunks" helps students recognize and spell words with similar final sounds more quickly and easily.

## VI. Graphemes and Morphemes

A **grapheme** is a written symbol that corresponds to a phoneme.

Graphemes can correspond to single letters, or they can correspond to specific sequences of letters.

- The grapheme "m" corresponds to the "mmmmm" phoneme.
- The grapheme "kn" corresponds to the "nnnnnnn" phoneme.
- The grapheme "igh" corresponds to the long "i" phoneme.
- The grapheme "eigh" corresponds to the "ay" phoneme.

A **blend** is a combination of two consonants in which **each letter makes a separate sound**.

A **digraph** is a combination of **two letters (consonants or vowels) that make one sound**. Note that "ch", "sh", "th" and "wh" are usually taught first.

- **Blends:** bl, br, dr, fl, fr, gl, gr, ng, pl, pr, sl, sm, sn, sp, st, sw, tr
- **Digraphs:** ai, ay, ea, ie, ou, oa, oy, uy, ch, kn, ng, ph, ps, qu, sh, th, wh, wr

A few graphemes represent phonemes with three letters (trigraph) or more.

- -air, -ear, -ure, -eigh, -igh, -ough

## Sounds to Letters, Not Letters to Sounds

One of the ways in which phonics may be made unnecessarily confusing is if letters are associated with sounds, as opposed to sounds being associated with letters.

For example, a teacher may point out that the letter "i" is long (i.e., it says its name) when a word ends in "e", e.g., *fine*, *like*, *tile*. If the sound is introduced and studied only in context of this pattern for an extended period of time, children are much more likely to become confused when the -igh pattern, in which "i" also makes a long sound (*fight*, *light*, *right*), is finally introduced.

If alternate patterns involving other sounds are also introduced sporadically and long after the original pattern has been taught—or worse, not explicitly introduced at all—the potential for general confusion is enormously multiplied.

**A far more effective method is to begin with the sound itself and, in the same lesson (or in a series of lessons, spaced out as appropriate for a particular child or group), cover all the spelling patterns associated with it.** While it may seem counterintuitive, this approach is ultimately less confusing because children do not have to repeatedly work to override internalized patterns.

A list of common alternate patterns is provided on the following page.

# Common Multi-Spelling Phonemes

AW - al (always, mall); au (applaud, fraud); aw (drawl, saw); o (cob, jot); oa (broad)

AY - a + final e (late, page); ai (afraid, rain); ay (bay, stay); ea (break, great); eigh (eight, weight)

C/K - c (cat, cup); ck (back, deck); k (dark, milk); ch (choir, ache); qu (unique, mosquito)

EE - e (me, we); e + final e (eve, meme); ee (meet, see); ea (clean, dream); ei (conceive, receive); ie (believe); ey (honey, money); y (funny, pretty)

ER - er (mother, under); ir (fir, sir); ur (burn, fur)

F - f or ff (fan, fit, stuff); gh (enough, rough), ph (graph, phone)

IE - i (child, mind); i + final e (fine, like); ie (lie, tie); y (dry, my); igh (fight, sigh); ye (eye, rye)

J - j (jam, jet); g + e, i, y (gem, giraffe, technology); dg + e (edge, judge)

N - n (name, no); kn (knee, know); gn (gnome, design)

OA - o (no, so); o + final e (bone, rope); oa (boat, coat); oe (doe, foe); ou (soul); ow (low, row)

OO (long) - o (do, to); oo (food, moon); u + final e (rule, tune); ue (clue, due); ew (flew, new)

OO (short) - oo (cook, foot); ou (could, would); u (put)

OU - ou (cloud, loud); ow (now, town)

OY - oi (coin, toil); oy (boy, toy)

R - r (ran, rip); wr (write, wrong)

UH - o (from, stomach); ou + gh (enough, rough); u (cup, stuck)

S - s or ss (say, miss, sip); ps (psychic, psychology); sc (science, muscle); st (listen, whistle); c + e, i, y (race, pencil, fancy)

YOO - u (unique, unit); u + final e (cute, distribute); ue (argue, cue), ew (few, spew)

## The Importance of Nonsense Words

One common criticism of phonics programs is that they often require students to read nonsense syllables in addition to real words. In contrast, three-cueing and Whole-Language-based approaches are based on the assumption that beginning readers benefit most strongly from focusing on "authentic" texts.

As discussed, this view fails to distinguish between how novices and experts read. The brains of skilled readers have already encoded numerous sound-letter combinations for automatic retrieval. Although these individuals can sound out familiar words, they do not need to go through the process of laboriously doing so each time they read them. And when they encounter new words, they can quickly sound them out by "chunking" them into familiar syllables and stringing them together.

In some cases, the syllables that make up a word may themselves be real words (e.g. *car-pet*), but in many cases they are not (e.g., *shi-ver-ing*).

**A child who cannot read nonsense syllables in isolation cannot then string those syllables together to sound out thousands of words. In fact, they will have no reliable means to break down unfamiliar vocabulary into manageable chunks and will essentially be forced to guess.**

Novice readers do not yet possess these automatic sound-syllable associations. In order to develop a "store" of them and be able to read new words quickly, they must be able to decode isolated syllables, whether or not they exist independently as words.

**To be clear, however: reading nonsense syllables should not be the aim of reading instruction but rather a side effect of learning to decode phonetically.**

**Morphemes** are the smallest meaningful units of speech. A morpheme can be:

- A prefix (*ex-*, *pro-*, *un-*)
- A suffix (*-ed*, *-ing*, *-s*)
- A root or main part of a word (*cat*, *graph*, *zoo*)

A word itself can be a morpheme, or a word can be made up of multiple morphemes. Note that the number of morphemes in a word can be different from the number of syllables.

- The one-syllable word *dog* also has one morpheme: *dog*.
- The one-syllable word *dogs* has two morphemes: *dog* and *-s*.

Morphemes are very important for beginning readers because the most common ones recur with extremely high frequency in virtually all texts and can be learned as "chunks" to be recognized automatically instead of re-sounded-out each time they are encountered. (See the list on the following page.)

Note that **children must be able to hear morphemes correctly in order to connect them to print**. A child who, for example, is accustomed to hearing the ending *-ed* dropped in speech must have their attention explicitly called to that pattern and may need to be taught basic concepts about verbs and tense. Listening, spelling, reading, and grammar are all intertwined.

# Common Prefixes and Suffixes

## Prefixes

**ante** - before

**anti** - against

**dis** - not

**co** - with

**im** - not

**micro** - small

**mid** - middle

**multi** - many

**non** - not

**pre** - before

**post** - after

**pro** - in favor of

**re**- again

**sub** - below

**trans** - through

**un** - not

## Suffixes

### Nouns

**age** - cour**age**

**er(s)** - contain**er(s)**

**ment** - apart**ment**

**ism** - critic**ism**

**ity** - activ**ity**

**or(s)** - actor**(s)**

**s** - book**s**

**sion** - confus**ion**

**tion** - react**ion**

**ude** - solitud**ude**

### Verbs

**ate** - creat**ate**

**fy** - beaut**ify**

**ed** - walk**ed**

**ing** - read**ing**

**ize** - realiz**ize**

**s** - speak**s**

### Adjectives

**able** - dur**able**

**al** - com**ical**

**ary** - ordin**ary**

**er** - long**er**

**est** - long**est**

**ful** - beaut**iful**

**ible** - terr**ible**

**ic** - fant**astic**

**(i)ous** - anx**ious**

**ish** - blu**ish**

**ive** - activ**ive**

**y** - prett**y**

## VII. Sight Words

Technically speaking, a "sight word" is a word that a reader recognizes and processes instantaneously, without conscious effort. In most discussions of reading, however, sight words are short, high-frequency words that, if memorized, allow children to read a significant percentage of most simple texts.

As discussed, English contains many common words with irregular pronunciations (e.g., *the*, *was*, *are*) that cannot be sounded out phonetically.

A common practice, however, is to treat all short, simple, high-frequency words as sight words, even if they are phonetic (e.g., *name*, *in*, and *get*). While this approach may sometimes be justified, for example if students are reading a book that contains a few words whose letter-sound correspondences they have not yet learned, broadly failing to distinguish between "little" words that are and are not phonetic deprives students of an important opportunity to acquire transferable knowledge and to "map" common sound-syllable relationships.

To take a very simple example, students who memorize *at* as a sight word may not automatically make the connection to *cat*, *sat*, *fat*, *rat*, and *mat*, and later to more complex words containing that pattern.

**As a general rule, the focus should be on emphasizing patterns that can be easily applied to new material. If a word has "transfer" potential—that is, rhymes—it should not be learned exclusively by sight as a whole.**

In addition, note that **many common words are only partially irregular**; most frequently, they contain only one irregular vowel sound. **The regular, phonetic aspects of these words can and should still be emphasized.** For example, the sole irregularity in the word *from* involves the "o" vowel; the consonants make their normal sounds.



## Irregular Words\*

As  
Are  
Be  
Because  
Been  
Come  
Does  
From  
Give  
Have  
Live  
Of  
One  
Pretty  
Son  
This  
Two  
What  
You

## Phonetic Words

All - mall, fall, tall  
An - can, ran, ban  
At - sat, cat, rat, mat  
Cry - dry, fry, try, by  
Dark - park, mark  
For - nor, or  
Fun - bun, run, sun  
In - bin, pin, tin  
It - bit, fit, kit, sit  
Late - date, late, rate  
Like - hike, like, pike  
Name - lame, tame  
Not - got, hot, not  
Old - bold, cold, mold  
Red - bed, fed, led  
Think - drink, sink, think  
Too - boo, coo, moo  
Well - fell, sell, tell  
Wet - bet, met, pet

To reiterate, virtually all of these words have phonetic components that should be emphasized when they are taught.

## VIII. Speed and Fluency

To become proficient readers, children must be able to recognize words quickly as well as accurately. Otherwise, by the time they arrive at the end of a sentence or paragraph, they have already forgotten the beginning. **Reading too slowly to understand a text is not proficient reading, even if the individual words are identified accurately.** Providing a slow reader with extra time is thus unlikely to solve the comprehension problem. To a certain point, speed is skill.

### Approximate reading speeds indicating proficiency:

- K-3: 140 words per minute
- Middle School: 170-240 words per minute
- Adult: 200-300 words per minute

**Fluency** refers to a reader's ability to connect written to spoken language—that is, to read at the speed of speech, with conversational intonation (**prosody**) and attention to punctuation. **For a reader to achieve fluency, all the sub-skills (phonemic awareness, syllable- and word-level recognition) must be mastered to the point of automaticity.**

Skilled readers read quickly by default and speed up or slow down as necessary. **Speed is the result of proficiency, not the cause.**

Consequently, insisting that children read quickly for the sake of doing so, without addressing the other factors, will not improve their prosody, comprehension, or accuracy. In fact, it will likely cause them to decline.

**To be fully effective, a reading program must address speed and fluency as well as letter-sound relationships.**

## Building Fluency

Prosody can essentially be viewed as a window into comprehension and ease of processing. A child who reads with appropriate intonation must be understanding what they are reading for the simple reason that it is virtually impossible to interpret a text vocally otherwise.

If you listen to beginning or struggling readers' rendition of a text, however, you will generally notice a distinct lack of prosody. Instead, readers may speak in a monotone, ignore punctuation cues, and group words in illogical phrases. For example, the sentence *The black dog jumped over the fence* might be read as *The black... dog jumped over... the... fence*.

Although this type of reading can largely be attributed to the mental exertion of decoding, some children—particularly ones with speech or general language difficulties—may simply not intuitively make the connection between spoken and written language. In such cases, teachers must explicitly reinforce the idea that the symbols on the page can be interpreted in a way consistent with normal speech. If a child cannot read aloud with natural intonation, they almost certainly cannot hear it in their mind when they read silently, hindering comprehension.

Fluency can be modeled in a variety of ways: expressive read-alouds with attention called to the relationship between phrases, punctuation, and tone of voice; reading a short passage to a student and then having them read it aloud back; or, for more advanced children, having them read easier texts aloud to younger children. **To be very clear: fluency exercises should never be a substitute for phonetic decoding, but rather a complement to it.**

**The importance of being able to read a text silently while hearing it in one's mind should not be underestimated. As texts get more sophisticated, this ability becomes crucial for recognizing situations involving humor, sarcasm, irony, and other non-literal meanings.**

## IX. The Reading-Spelling Connection

**Although reading is often treated as a skill distinct from spelling, in reality they are two sides of the same coin.** In fact, understanding how students (mis)spell can provide important insights into how students process letters.

### Phonetic Misspelling

Although a progressive-sounding method like **inventive spelling** might seem more likely to be associated with the Whole-Language movement, it can actually be an important technique for children learning to decode phonetically.

Because written English does have so many spelling irregularities, it is crucial that beginning readers be given the opportunity to practice literally applying the patterns they have learned and solidifying the relationship between letters and sounds. Obviously, teachers do eventually need to begin insisting on correct spelling, and persistent difficulties should be evaluated as necessary; however, **in the very early grades, phonetic-based spelling errors (e.g., writing *ackshun* instead of *action* or *riseve* instead of *receive*) may actually be a positive sign, indicating that a child is learning to match sounds to spellings in a logical way.**

### Phonemic Misspelling

Some children may also misspell words because they **cannot accurately identify certain sounds**. This problem frequently involves vowels, but consonants can be problematic as well.

For example, it is reasonable to infer that a student who writes *flessibol* instead of *flexible* or *way* instead of *why* in an attempt to spell phonetically may have difficulty identifying the "x" and long "i" sounds. If the student's spelling is corrected without their attention being drawn to the sounds contained in those words, the underlying problem is likely to persist.

## Memorization-Based Misspelling

On the other hand, **the errors of children who have learned to read through a combination of memorizing and guessing are likely to be far more random and illogical.** They may, for instance, write *wrong* as *wonrg* because they have memorized by rote rather than by learning that "wr" makes an "r" sound, and are unable to accurately remember the order of the letters. Or they may write *frezze* instead of *freeze* because they remember that one of the letters in the middle of the word is supposed to be written twice but do not connect the "ee" sound to the double vowel. Although the error may seem minor, it actually suggests a fundamental lack of understanding.

Likewise, students who have not learned to pay attention to sound-letter correspondences may spell the same word multiple ways within the same sentence or paragraph; a correct spelling may simply represent a lucky guess.

When children display this kind of haphazard attention to written language, inventive spelling is of little use and may be harmful because it reinforces the idea that words are not spelled the way they are for any particular reason.

In practice, of course, a student's writing can display multiple types of errors, and you must be able to distinguish between them in order to determine the underlying points of confusion as well as what sort of intervention is required.

On the next page, we're going to look at an excerpt from an essay written by a fourth grader. (It's based on the question, "In your opinion, what is the most important invention?")

All inventions are useful in life the lightbulb, car, plane, and computer. But to me solar power is the best.

One reason is that some cars are powerd by solar power. solar power cars can make us stop using fosol fules so much. NASA is makeing solar powered cars.

Another reason is that hoase are using solar power. solar powered hoases can stop us from a lot of power. people are adding solar panlans to their homes.

(All inventions are useful in life the lightbulb, car, plane, and computer. But to me solar power is the best. One reason is that some cars are powerd by solar power. solar power cars can make us stop using fosol fules so much. NASA is makeing solar powered cars. Another reason is that hoase are using solar power. solar powered hoases can stop us from a lot of power. People are adding solar panlans to their homes.)  
[https://tea.texas.gov/sites/default/files/2019\\_STAAR\\_G4\\_Writing\\_Scoring\\_Guide.pdf](https://tea.texas.gov/sites/default/files/2019_STAAR_G4_Writing_Scoring_Guide.pdf)

Although this piece contains some straightforward phonetic misspellings (*solor*, *powerd*, *fosol*), it also displays a host of other issues suggesting a need for remediation on multiple levels.

The spelling of *reason* as *resson*, for example, suggests that the writer either has difficulty identifying the long "e" sound or is spelling in part by memorization (a phonetic misspelling would be something like *reeson* or *reazun*). The misspelling of *houses* as *hoase* could also point to a phonemic awareness issue, or it could indicate that the student learned to spell *house* by memory and cannot remember which vowel follows the "o". Moreover, the missing "s" in that word as well as the dropped "e" in *powerd* indicate the student is struggling with suffixes as well. Finally, the misspelling of *panels* as *panlans* indicates a significant deficit in understanding sound-syllable correspondences.

## Reversing Letters

It is common for young children to reverse similar-looking letters, e.g., "b" and "d". While this type of error is often taken as a sign of a potential reading disorder, many children without serious issues do this through second grade.

It is important to keep in mind that letters are ultimately arbitrary symbols: there is no particular reason why a straight line with a circle attached to the bottom right-hand side represents the first sound in *boy*, other than the fact that the English alphabet happened to evolve that way.

Children beginning to read, however, may take their cues about letters from their understanding of how physical objects behave. They know that if, say, a chair or a spoon is flipped upside down, it does not stop being a chair or a spoon. They may then apply the same principle to letters, not grasping the idea that a "b" becomes a "d" when the circle is moved to the other side of the line, or a "p" when it is moved to the top. Furthermore, more English letters face right than left, leading children to treat right-facing letters as the default option.

One way to address this issue is to play a "game" in which you rotate/flip a letter in different directions, and ask the child to say when it is and is not the letter.

**It is important to begin this exercise using only one letter/sound at a time, because working with multiple letters simultaneously is likely to place too much of a strain on the child's working memory and add to their confusion.** As the child becomes more adept at recognizing individual letters, you can gradually add more letters into the mix.

You can also try the "b-hand" method shown by Linda Farrell of Readsters in this wonderful video:

<https://www.readingrockets.org/shows/reading-interventions/letter-reversals-b-d-with-aiko-second-grade>

## X. Dyslexia

**Dyslexia is a brain-based disorder characterized by difficulty perceiving and discriminating between sounds, e.g., "ch" and "sh" (phonemic awareness). It can also involve trouble retrieving known words from memory.** Individuals with dyslexia typically struggle to match sounds to letters, decode accurately and fluently, and spell correctly. Diagnostic criteria vary, but the percentage of the population that is dyslexic is estimated at around 10%.

One of the hallmarks of dyslexia is that these problems are generally **inconsistent with a person's overall level of intelligence**; they are not predicted by difficulties in other areas.

Despite this knowledge, dyslexia remains poorly understood by many members of the education community and continues to be surrounded by myths.

### Dyslexia Myths

- Dyslexia is primarily a visual problem characterized by switching letters and/or writing them backwards.
- Dyslexia is a disorder that children naturally grow out of.
- Dyslexia cannot be diagnosed until after children have learned to read.
- Dyslexics are just lazy and/or unintelligent.
- Poor reading skills cause dyslexia.
- Phonics alone can cure dyslexia.
- Dyslexia does not exist.



## Dyslexia and Phonics

While children with dyslexia will struggle disproportionately in reading programs based on the assumption that children will naturally intuit sound-letter relationships, or that teach phonics in a haphazard way (e.g., by calling attention to letter-sound relationships only when children struggle with a particular word), they also have trouble in highly systematic phonics programs that are letter-based from the start.

The primary underlying problem in dyslexia generally involves the ability to process sounds, and it is impossible to match letters to sounds that one cannot identify or distinguish from other sounds. As a result, remediation for children with dyslexia must begin by systematically teaching them to identify sounds.

Although dyslexia becomes apparent when children begin learning to read, dyslexics show processing differences when compared to non-dyslexics long before they enter school and can be identified via aural letter-naming, phoneme/rhyme-identification, and blending/segmenting tasks well before they begin to experience difficulties with print. Early detection is important because it can help avert years of unnecessary struggle.

## Dyslexia vs. "Dysteachia"

Note that children who are taught to read poorly may display some of the same compensatory behaviors as dyslexics (skipping, guessing, relying on images) but do not actually have an underlying problem with phonemic awareness: if they are given appropriate remediation, they will pick up sound-letter correspondences much more quickly and easily, and will require far less repetition to hear subtle distinctions between sounds.

For more information about dyslexia, see: <https://www.mayoclinic.org/diseases-conditions/dyslexia/symptoms-causes/syc-20353552>

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