Chapter 1

The Science of Reading in Seven Key Arguments

Imagine a world in which systematic, synthetic phonics in early reading are a non-negotiable in the primary grades. This world seems increasingly possible as parents, educators, administrators, and even lawmakers become more attuned to their critical importance.

But if we changed the game for reading acquisition in the primary years, and then failed to make informed decisions about what to teach, and how, in grades 3, 5, 8, and 10, our victory would be largely pyrrhic. So it is important to ask: After we've nailed phonics in the early grades, what does the science tell us should happen in reading classes from then on?

In this area "beyond phonics," what is now common practice is often misinformed. In this area, too, change can cause anxiety and resistance. We hope to make embracing the science easy and, just maybe, to help teachers use and adapt it well to ensure success in reading—and, just maybe, joy, for students and for you, their teacher.

We'll use this chapter to describe important research that we think should inform three critical areas of literacy instruction: teaching decisions, lesson design, and text selection, because teachers can't determine what they should be doing on Monday morning until they understand how people think, read, remember, and make sense of the language they experience in a text.

But teachers also need guidance on how to translate that research into practice.

For example, let's say you're aware that there's strong research behind the power of intentional writing activities in literacy instruction. They can help increase students' mastery of complex syntax, something that also helps them when they are reading. Okay, great. Now you need some tools to figure out what it looks like to have students write more, and more intentionally, in a real classroom with thirty-two students and the clock ticking. It would be helpful to see examples of the writing exercises other teachers have used and what they've learned about them. It would be helpful to see video showing how teachers use those exercises, and how students react, in real classrooms.

To use the research, you'd want to know how to adapt those writing exercises for third graders or ninth graders. Or how they might be designed differently at the beginning of a book unit versus at the end.

You'd need to know what to do when students struggle: when you'd asked them to write, say, but they didn't actually write much of value, and you didn't know if they *wouldn't* write or *couldn't write in the way you wanted them to because no one had ever asked them to*.

You'd need some guidance on how to get them writing, and once that happened, how to combine the writing with the other things that also work? What's the dosage of each? What are the potential pitfalls? How do you adapt to different students?

Just because you know what the research says does not mean that developing and implementing better lessons is going to be automatic- or easy.

Happily, we are translators of the research, as we noted in the introduction, and this is the thing that interests us most.

We have spent a lot of time studying how the research shows up in real classrooms and, in particular, studying the moves of teachers whose results suggest they know a thing or two about what, when, and how. You'll see a lot of videos of those classrooms as you read the chapters to come.

We've also written a reading curriculum to try to help make it easier for teachers to use the research effectively. Our curriculum is for grades 5–8 but we're also developing one for high school, and we have spent a fair amount of time helping teachers in grades 3 and 4 adapt the ideas, too. We'll share lots of examples of how we tried to design lessons to leverage the science. As we hope is implicit, we don't offer them as models of perfection. You'll want to adapt and change things. You'll like some suggestions more than others. They're a starting point, surely an imperfect one, but also one that reflects a fair amount of experience and reflection.[1]

All of which is to say that we believe in research, but we think understanding it is only the beginning. Translating it requires diligent study. Like everyone else, teachers are more likely to give up on a useful idea because some foreseeable challenge caused their first efforts to go poorly. A teacher who says, "I asked them to write but they didn't" or "I asked them to write but what they wrote wasn't good" is a teacher who is at risk of becoming skeptical of or giving up on research that could make her and her students more successful. Good ideas get thrown out because they are challenging to implement. And, frankly, in a classroom of thirty students in this day and age, very few things are easy to implement.

So we spend Chapters Two through Eight getting very practical to help you bridge the gap between "get it" and "do it." But the first step is to be explicit about what we think the relevant science says about reading classrooms "beyond phonics." We'll do that in this chapter. We think knowing this research is part of being a successful teacher. And, honestly, we think you'll find it as fascinating and as we do.

A BROAD BASE OF RESEARCH

In discussing the research, we will draw on sources that examine a wide range of topics. We'll discuss the profound importance of background knowledge and vocabulary, for example, and the under-acknowledged degree to which fluency is a primary barrier to comprehension.

We'll also range a bit wider and discuss the importance of selective attention to the development of reading especially in the age of attention-fracturing smartphones. We'll look at research on writing and how it suggests teachers can accelerate the development of reading proficiency. And we'll look at research that suggests that when we encounter information in stories, especially in "long form" (i.e., books) the result is especially effective for learning. As we indicated in the Introduction, we will discuss only in small part the overwhelming importance of phonemic awareness and a systematic, synthetic approach to phonics in early reading acquisition. In primary grades they are a non-negotiable and we presume their application here.

We hope to make the research we present here easy to use well and flexibly to ensure students' success. And just maybe to create more joyful reading classrooms. For students and for you, their teacher.

Let us linger on the topic of joyful classrooms for a moment. One common argument we hear is that students won't like instruction that is better aligned to science. Perhaps some of this is projection—teachers worry that *they* won't enjoy a different approach to teaching but

justify it on the grounds that students won't—but some of it is sincere worry. Won't using science be formulaic and joyless for students? We've met teachers who are aware that reading problems are mostly knowledge-based but think instilling that knowledge will be boring.

Happily, we don't think this is true and we think we can prove it to you by showing you classrooms where it is emphatically not the case. In fact, we think teaching that applies the science of reading and learning is very likely to be *more* engaging for students. After all, as education researcher Carl Hendrick points out, "Motivation doesn't always lead to achievement, but achievement often leads to motivation."[2] Or, put another way, "the actual effect of achievement on self-perception is stronger than the other way round."[3] Perhaps the biggest motivation to a learner is the knowledge that they are succeeding and making progress.

So let us start this book by sharing the key arguments that we think should shape reading instruction "beyond phonics."

SEVEN KEY RESEARCH-BACKED ARGUMENTS ABOUT "POST-PHONICS" READING

In the remainder of this chapter we describe each of the book's seven key arguments and the basis for our belief in them. We will expand on each argument and dig deeper into how to apply the research in each area in the subsequent chapters.

Attention Is Central to Every Learning Activity, Especially Reading, and Building Attention Is a Necessary Step in Effective Reading Instruction

> *Attention is the currency of learning in almost any task. But reading, especially, relies on and requires states of sustained focus and concentration. If the smartphone has taught us one thing it's that people's attention is malleable, but this also means we can intentionally build students' capacity to attend to what they read.*

Attention is "central . . . for every function we perform," writes reading researcher Maryanne Wolf.[4] It is the cognitive function that allows us to select what sensory inputs we pay attention to and sustain our focus there for a period of time, locking in on the task at hand and locking out potential distractions.

We know that the quality of attention paid by learners shapes the outcome of most learning endeavors. You can only learn about what you are paying attention to. Attention is always a prerequisite to learning.

But reading poses particular challenges to attentional skills. Staying focused on a long and challenging text for an extended period of time requires an especially high level of focus and self-regulation, for example, and all aspects of reading, from letter recognition to the most advanced forms of comprehension, are highly responsive a student's ability to focus attention on the task at hand (or lack thereof). Perhaps not surprisingly, then, Courtney Stevens and Daphne Bavelier describe attention as having "reverberating effects" on language and literacy.[5]

"Readers' attention had significant effects on reading speed, prosody, word recognition and comprehension," Mustafa Yildiz and Ezgi Çetinkaya conclude in a study of fourth graders. "To improve good readers' prosodic reading skills and increase their reading speeds, attention-enhancing activities are needed."[6]

And in fact it turns out that the ability to sustain and manage one's own attention is not fixed. "Selective attention is also highly malleable," Stevens and Bavelier write. "Data indicate that attention skills can be enhanced, and distractor suppression may be especially modifiable. In a classroom context, there may be large benefits to incorporating attention-training activities into the school context . . . with evidence for improvements in children's selective attention."[7] Attentional capacity is affected by our habits and is subject to change.

One reason for this has to do with the idea that reading is relatively new, biologically speaking. As a species, we've been reading for perhaps five thousand years (and for most of that time only a comparative minority of the species could read). Compare that to speaking, which we have been doing some form of somewhere between half a million and a million years.[8] The result is that our brains have had time to evolve for speech but not for reading. There are portions of the brain dedicated to speech and so this capacity develops naturally. A baby left untaught will begin to babble. It will copy its parent(s) and most likely learn to speak without intervention or support. Speech is "natural," this is to say. Reading is not. There is no reading portion of the brain; a baby left to its own devices will not learn to read. In fact, when we learn to read we are repurposing portions of our brain designed for other activities and rewiring them in service of deciphering text, Wolf notes in *Reader Come Home*.[9]

The idea that the brain wires and rewires based on what we use it for is called *neuroplasticity*. One important implication of this is that our neurons "wire how they fire," that is, students are rewiring every time they read shapes how they will and can read going forward. This is relevant in a variety of ways but in particular in preparing students to sustain attention in an age of persistent technological distraction. When we read on screens, we toggle to new sources of information constantly and so risk wiring our brains first to expect distraction

and then to seek it out, to be hoping to be distracted by some cognitively easier task while we read. The more we read in a state of distracted half-attention, the more we come to hunger for new stimulus, the more distracted we are as readers, and the more we degrade our capacity to read with focus for a sustained period of time. This has always been a challenge but it is exponentially more so now. It's not just that smartphones make us read less; it's that they cause us to read differently.

"The process of learning to read changes our brain, but so does what we read, how we read, and on what we read (print, e-reader, phone, laptop)," writes Wolf. "This is especially important in our new reality, when many people are tethered to multiple screens at any given moment."[10]

Imagine a certain teenager. Perhaps he is one of your authors' very own children. Imagine him lying on the living room couch reading a book with his cellphone resting on his chest. Every few seconds, it vibrates with a new notification. He ignores some of them but they still break his concentration. And every so often he picks up his phone to check. His attention is broken. He returns to the book after a while but his experience of it is different. He's only partially in the world of Jonas in *The Giver* or the Youngers in *A Raisin in the Sun*. The experience is not as all-encompassing and immersive: he reads not just less but less deeply and, as Wolf puts it, "Deep reading is our species' bridge to insight and novel thought."[11]

At first it is the cellphone itself that distracts him but after a time it's as if the cellphone were inside of him. His brain has rewired to seek out distractions, even when the phone is not providing them.

Fortunately attentional skills can also be increased. Making a habit of concentrating for sustained periods of time makes us better at concentrating for sustained periods of time. *Sustained focus and deep immersion in the text are habits we have to instill in students if we want them to have them*. It just takes intentional action by teachers.

One of the simplest ways to do this is to go "low tech/high text" in the classroom. That is, to reduce the number of screens—given that the mere presence of screens tends to increase distractibility—and the amount of screen time, and to increase the amount of time spent in sustained reading of text. A great reading classroom, we argue, should feature text in hard copy with students annotating to shape and focus their attention as they read. So while many teachers are encouraged to think they are not teaching when they are reading with their students, we disagree. We are all in favor of class time spent reading—a topic we take up in Chapters Two, Seven, and Nine.

Fluency Is a Prerequisite to Reading Comprehension at All Grade Levels

> *Fluency is the ability to read words quickly and easily as soon as they are encountered*. Quickly and easily *are important: they imply the lack of reliance on working memory. If the reading itself requires conscious thought, that process will crowd out other more advanced cognitive activities that are required to make meaning of text*.

The simplest definition of reading fluency is "the ability to read *at the speed of sight*." We take this from Mark Seidenberg's book of that title. It refers to the ability to absorb the meaning of written text as soon as you look at it—to decode not only individual sounds but words and phrases as soon as you perceive them.

Fluent readers rarely have to hesitate to think about what the words they are reading say or how they link together. Of course, there are times—with an especially complex text or when attention has drifted—when even fluent readers may have to reread a passage to make sense of it, but for the most part meaning accrues as words are glimpsed. There is no discernable delay and little conscious effort.

When you can read effortlessly, without having to think about it, your working memory, that critical part of your brain for encoding memory and building understanding, is free to do other things, like think about the meaning of the text or perceive details within it. When the first parts of reading are automatic, conscious thought and attention are freed and can be used elsewhere. If you cannot read at the speed of sight, your ability to understand, think about, and remember what you have read will be limited. Period. For this reason, *fluency is a prerequisite to comprehension*.

In fact in most cases a fluent reader can't *not* read a piece of text in their native language. You see a road sign and have processed that it says "No Parking" as soon as you've perceived the words. The reading happens so quickly, effortlessly, and automatically[12] that you do not have time to decide not to read it. Making a conscious decision takes about half a second and by then you would have read the words. Only if you were highly distracted could you look at the sign and *not* read it.

If you are a fan of Duolingo, say, or have experience trying to learn a foreign language, particularly as an adult, you have probably experienced the sort of effortful reading that is common for dysfluent readers. You must pause to consciously recall word meanings or decipher phrases. You can often figure these out within a few seconds, but only through

conscious effort. By the time you've done that you have to circle back to put the ideas together meaningfully. Read the first part of the sentence again, to put the ideas together. When listening or reading, you can keep up for a sentence or two but your working memory is soon overloaded and you lose the ability to sustain meaning making. It's intense cognitive work and you tire quickly. As long as you have to extend effort to decipher the words, you are not yet able to read in the fullest sense of the word.

In fact, fluency requires three distinct things at once. First, it requires accuracy. You must reliably read the sounds and the words correctly. While decoding is the name of this process for speech sounds, orthographic mapping is the name for the process by which each unique sequence of letters becomes "glued" in your mind as a word. You see it, recognize the word nearly simultaneously, and no longer need to fully decode it.

But fluency also requires automaticity, which is accuracy at speed. Reading rate is an important precursor to reading comprehension. Faster isn't always better but a certain base level of rapidity is almost always required. Many researchers posit 110 words per minute as a baseline rate. For example, in a 2003 study, 91% of students who had oral reading fluency scores at or above 110 words per minute also scored proficient (level 3 or above) on the Florida Comprehensive Assessment Test.[13] Students who did not score 80 words per minute correct were almost assured to do poorly on the FCAT.[14] Students who cannot read accurately *and quickly* are at high levels of risk for reading failure.

Finally, fluency requires prosody, which is "appropriate expression or intonation coupled with phrasing that allows for maintenance of meaning."[15] Prosody enables us to invest the words we are reading with meaningful expression so they sound like they might if they were spoken aloud. It allows us to emphasize a certain word in a sentence or to link the words in a phrase together. It is *meaning made audible*.

Accuracy plus automaticity plus prosody is the fluency formula, and multiple studies have demonstrated its deep connection to comprehension as well as the fact that far fewer students have mastered it than you might expect.

Studies find that about half of demonstrated reading comprehension is predicted by reading fluency. David Paige and his colleagues at the Northern Illinois University found, in a study of sixth- and seventh-grade students, that oral reading fluency explained between 50 percent and 62 percent of differences in reading comprehension.[16] J. Sabatini, Z. Wang, and T. O'Reilly[17] studied the connection between fluency and overall scores on the 2002 NAEP reading assessment and found that "the strongest predictor of NAEP comprehension scores was reading rate." Christy Bloomquist (2017) found that 45 percent of the variation in reading

comprehension levels among fourth- and fifth-grade students in Colorado[18] was attributable to oral reading fluency.[19] It's likely that the predictiveness of fluency declines slightly as students age but Chris Schatschneider and colleagues[20] found that reading fluency accounted for about a third (32 percent) of reading comprehension scores among tenth graders. Even that late in a student's career, the connection remains strong.[21]

"Slow, capacity-draining word recognition processes require cognitive resources that should be allocated to comprehension. Thus reading for meaning is hindered," Keith Stanovich and Anne Cunningham summarized in their 1998 analysis *What Reading Does for the Mind*. They also outlined a secondary effect of dysfluency: "Unrewarding reading experiences multiply." Struggling to understand and reading without understanding much makes reading appear to have less value. Place this alongside the greater cost in terms of effort required for dysfluent readers and the value calculus tips away from reading. "Practice is avoided or merely tolerated," Stanovich and Cunningham note, and it is done "without real cognitive involvement."[22] Dysfluent readers stop wanting to read or experience reading to be not especially meaningful. The gaps between them and their classmates widen.

Though research into the scale of dysfluency is limited, studies suggest that it is a widespread problem. Analyzing the data from John Sabatini's study of more than seventeen hundred fourth graders, for example, Paige notes that "41.7% of 4th grade students—almost half—appear to have reading fluency issues," and that such issues are "strongly associated with poor performance on the NAEP."[23] A 1995 report by the National Center for Education Statistics found similarly that just "55 percent of fourth graders were considered to be fluent," and that after reading a passage twice silently, only about 13 percent of the fourth graders in a NAEP study "could read with expressive interpretation and consistent preservation of the author's syntax."[24]

Moreover, fluency remains a pervasive issue among older students. Paige found gaps in fluency and a strong correlation to comprehension among sixth- and seventh-grade students, well beyond the years where most schools remain attentive to fluency, and in Schatschneider's study of Florida students, more than half of tested tenth graders demonstrated fluency rates below proficient.

And the effects are of course not limited to testing. A study of Italian[25] students found that "reading fluency predicted all school marks in all literacy-based subjects, with reading rapidity being the most important predictor." The authors added, "School level did not moderate the relationship between reading fluency and school outcomes, confirming the importance of effortless and automatized reading even in higher school levels."[26]

Two findings jump out from that statement—first the simple importance of rapid reading specifically and second that fluency matters at all grade levels—though it is least likely to be assessed and therefore recognized among older students. (The students in this study were in grades 4–9.)

Despite this data, "fluency has been relatively neglected beyond the elementary grades," Paige observes. There is, he writes, "little instruction occurring . . . to improve reading fluency" beyond the mid-elementary years and by middle and high school, teachers are more likely to "employ work-arounds so students don't have to read text" during class.[27]

Research suggests that fluency poses a hindrance to comprehension for close to half of students even into high school in other words. "At the end of the day, my hunch is that 40 percent to 50 percent of middle school students do not have proper reading fluency," Paige told us. "In schools where students generally struggle with academic attainment, this percentage is likely closer to 80 percent."[28]

Given that the texts students are expected to read become more complex and therefore demanding from a fluency standpoint, there is little reason to suspect there are not large numbers of students in high school and even college for whom reading fluency is a massive and hidden barrier to reading comprehension. And when that is the case, we are less and less likely to know about it. When was the last time the average ninth grader's oral reading fluency was assessed?

A colleague of ours observed that, as a teacher, she rarely asked older students to read aloud and so knew little about their fluency. The same was true with her own children, who were in middle school. "I suddenly realized that it has been years since I even thought about their fluency."

She's right to be worried, especially given that almost all of the existing research data was conducted before the precipitous rise of the smartphone and social media, which have dramatically reduced independent reading outside of school among American teenagers to a fraction of what it once was (see Chapter Two). The problem is almost assuredly worse now.

Once Students Are Fluent, Background Knowledge Is the Most Important Driver of Understanding and Comprehension

> *A common misunderstanding about reading comprehension is that it involves transferable skills like making inferences that once learned can be applied to other texts. Unfortunately there is little evidence that these skills translate, but significant evidence that they happen naturally when readers have sufficient background knowledge to disambiguate texts.*

One of the themes of *Middlemarch*, George Eliott's classic nineteenth-century novel, is Mr. Casaubon's fruitless pursuit of a concept he refers to as "the key to all mythologies." A scholar, he imagines a single understanding that will illuminate the true meaning of every tale. He spends his life toiling at the task of finding this universal key.

It's hopeless, of course. The novel reveals his delusions. When he dies, his once-admiring wife, Dorothea, at last reads his papers and can see that the project was absurd from the start, but the reality proved all but impossible to acknowledge *because the dream was so beautiful*. It was a "chimera," something so alluring the believer desperately wants it to exist even when the facts are saying it cannot be so.

The belief in transferable skills is perhaps the most common chimera among teachers of reading. Imagine a handful of universal tools we could teach students and in so doing enable them to understand every text they read. Who wouldn't seek out "the key to all inferences," for example, knowing that once mastered this skill would allow our students to unlock what was unspoken in every story? Or the "key to main ideas," which would enable them after a bit of diligent study to grasp the gist of any passage we put in front of them for the rest of their lives. Who among us would not dream such a beautiful dream?

The problem is that for all the beauty of the dream, the evidence is squarely against it. Beyond a bare minimum amount, "Practice brings no benefit to reading-comprehension strategy use," Daniel Willingham writes.[29] Summarizing the finding of recent studies, he writes that beyond a very small amount of brief explanation, "There was no evidence that increasing instructional time for comprehension strategies—even by 400 percent!—brought any benefit."[30]

Take inferences, for example. While we make inferences constantly while reading, and while doing so clearly assists with comprehension, *practicing* strategies like making inferences doesn't help much and there's no evidence that the ability to make inferences well transfers from one book to another. "People don't decide that they're going to make these inferences, the mind just makes them happen," Willingham says.[31] The reason for this is that our ability to inference is a function of our prior knowledge.

Here's an example from a third-grade classroom we recently visited. The class was reading *Charlotte's Web* when they came across this scene:

> *"But Charlotte," said Wilbur, "I'm not terrific."*
>
> *"That doesn't make a particle of difference," replied Charlotte. "Not a particle. People believe almost anything they see in print. Does anybody know how to spell terrific?"*

"I think," said the gander, "It's tee double ee double rr double rr double eye double see see see see see."

"What kind of acrobat do you think I am?" said Charlotte in disgust.

The teacher paused and asked why Charlotte was disgusted. Two students responded. The first said because the gander always talked too much. The second because the gander always said everything three times. Both of which are true and both of which are wrong if the goal is to explain why Charlotte was disgusted.

Perhaps students didn't understand how to infer a character's point of view from her words. This would be the assumption in a lot of classrooms, and the result would be a lesson (or a series of lessons) on the "skill" of inferencing.

But the source of the problem was revealed when the teacher asked, "Who knows what an acrobat is?"

There was a smattering of two or three hesitant hands. A boy who'd raised his responded, "It's a little bit like a magician, I think."

Charlotte, for those who haven't read *Charlotte's Web*, is disgusted because she intends to write the word in a spider web and the gander's very long spelling of the word implies lots of work hanging precariously from a web for her. But if you don't know what an acrobat is, you cannot know that. The problem was not a skill problem. Knowledge cues an inference and without it, no further explanation of how to make an inference or what an inference is will help much.

The knowledge enables the inference. This is an inconvenient fact. It means we can't just explain and practice and have students get better at inferencing. There is no Casaubon-like short cut. We instead have to go the long way around and make sure students have the background knowledge they need to make better sense of what they read.

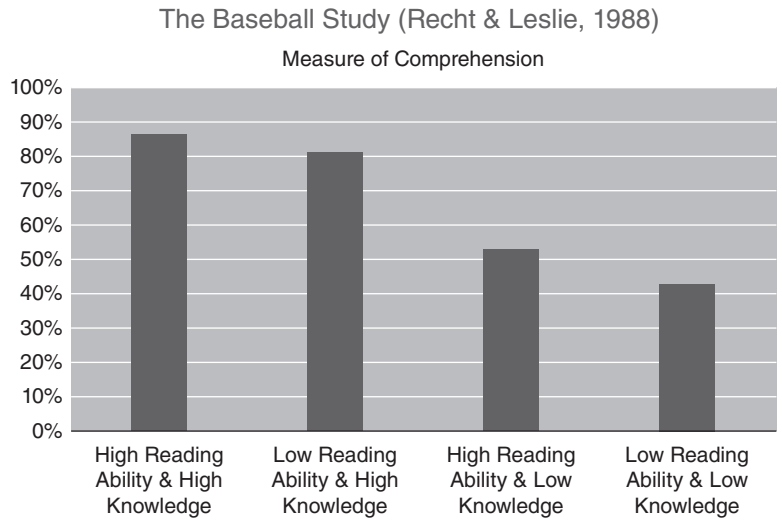
As Dylan Wiliam writes in *Creating the Schools Our Children Need,* "The big mistake we have made in the United States is to assume that if we want students to be able to think, then our curriculum should give our students lots of practice thinking. This is a mistake because what our students need is more to think with." [32]

A classic study by Donna Recht and Lauren Leslie, known as "The Baseball Study,"[33] demonstrates this. The authors divided sixty-four seventh- and eighth-grade students into two groups based on their reading levels: weak readers and strong readers. But they also divided those groups again, based on whether the students knew a lot about baseball. Now they had four groups: good readers who knew a lot about baseball and good readers who knew very little about baseball; weak readers who knew a lot about baseball and weak readers who knew very little about baseball.

They gave them a passage about baseball to read. Here are the first few lines:

> *Churniak swings and hits a slow bouncing ball toward the shortstop. Haley comes in, fields it, and throws to first, but too late. Churniak is on first with a single . . .*

After students read the passage, the researchers tested the four groups of students to see how much of the passage they understood. Some of the results were exactly what you'd expect:



The students with high reading ability and strong knowledge of baseball had no trouble with the passage. They got almost all of the answers correct. By contrast, the weak readers with weak knowledge of baseball really struggled. They got less than half the questions right, scoring little above the level you'd expect them to get if they were merely guessing.

The surprise was in the two middle groups. The students with low reading ability but strong knowledge of baseball did better than the high-ability readers with little knowledge of baseball. Quite a lot better in fact—they were a few points behind the top group and scored almost 30 percent better than the students who were "better" readers but knew less about the topic of the passage.

It's a study that has been repeated many times with students reading about different topics, and it demonstrates quite elegantly that you read well and successfully when and because you have background knowledge of what you are reading about. To return to Dylan Wiliam's point: if we want students to understand and think more deeply about what they read we

should focus on knowledge and not waste time trying to teach them abstract skills like making inferences or finding the main idea.

The reason why this is the case has to do with what you might call the inherent ambiguity of every text. As Daniel Willingham recently pointed out,[34] every sentence is to some degree ambiguous. An author never tells you everything. If he or she did, reading would be incredibly tedious and meaning making would become nearly impossible.

As an example, we've rewritten the previous two sentences to eliminate ambiguity and ensure your accurate comprehension of our exact point regardless of background knowledge:

> *An author of a book, article, poem, treatise or other example of a written text in English or any other language never tells you—in this case the reader but also people like the reader who might also be reading or be imagined to be reading said text—everything that he or she intends to communicate in that text because if he or she did, reading would become incredibly tedious due to the overwhelming load of marginally relevant information jammed into the sentence in order to clarify every possible misunderstanding or gap in perception, and meaning making would become nearly impossible because every text would read like a dense contract between two corporate entities seeking to eliminate any possible gray area to a transaction.*

Authors by necessity always make assumptions about what readers know and assume they will fill in gaps. This is always true, even when they aren't deliberately leaving blanks and ambiguities for stylistic or artistic reasons. Understanding any text always involves "disambiguating" it.

Here's a very short text, the ambiguities of which make an interesting case study:

> *The wooden box was massive. She placed her bear on the ground. It was going to be hard to carry.*

The ambiguities are probably not even apparent to you at first because you resolved them simply and easily with inferences you didn't know you made. One ambiguity is that her "bear" is not a real bear but a teddy bear. There's no way she'd be carrying a real bear. As a result you probably inferred that "she" was a child. Another ambiguity involves resolving what noun the pronoun "it" refers in the second sentence. Grammatically it's just as plausible for it to refer to the teddy bear as the box. But you knew that it referred to the box. It doesn't make sense for a teddy bear to be hard to carry but a massive wooden box, yes. Especially for

a child. You disambiguated because you had knowledge—the weights of common things, that someone with a teddy bear is probably a child—that the author assumed you would have.

But what if the author assumes you know something you don't. Like in this sentence:

For pudding she allowed herself some cake.

If you're a reader in England, where "pudding" means roughly the same thing as "dessert" does to an American, the sentence is easily disambiguated. She ordered cake after dinner. It was a small indulgence. This is implied by the phrase "she allowed herself."

But if you lack that background knowledge, the sentence is nonsensical, even if you are a very good reader.

Your working memory is busy wrestling with what seems like a riddle—for pudding she had cake? How could she have cake for pudding? Does the author mean "instead of pudding" maybe? (If you are English imagine the sentence "For custard she had cake" to get the general sense for how an American might experience the text.) You not only failed to understand the first part, you might not have even noticed or perceived the subtle implications of the word *allowed*, which tells you quite a bit about the "she" in the sentence and the small indulgence of permitting herself a piece of cake that perhaps she wouldn't ordinarily consider: perhaps she is conscious of her weight, perhaps she is conscious of money. When your working memory is overloaded wrestling with something you don't immediately understand, your perceptiveness of other details is also degraded. Meaning is interrupted everywhere. There is no "story" in the sentence for readers who don't have background knowledge about what "pudding" means.

Comprehension, this is to say, is knowledge-based. We make better inferences, we perceive more, we have working memory to think more deeply, when we know more about what the author assumes we know enough about. We can't do those things when we don't have this knowledge.

In a 2020 review of the literature, Reid Smith and colleagues "consistently found that higher levels of background knowledge enable children to better comprehend a text. Readers who have a strong knowledge of a particular topic, both in terms of quantity and quality of knowledge, are more able to comprehend a text than a similarly cohesive text for which they lack background knowledge. This was evident for both skilled and low skilled readers."[35]

"Controlling for other factors, knowledge plays the largest role in comprehension. The more a reader knows about a topic, the more likely they are to successfully comprehend a text about it," literacy specialist Jennifer Walker of Youngstown State writes,[36] summarizing the broader literature on the topic.

In fact, the connection between knowledge and all types of high-order thinking is clear, if often overlooked. "Data from the last 30 years lead to a conclusion that is not scientifically challengeable: thinking well requires knowing facts. . . . The very processes that teachers care about most—critical thinking processes like reasoning and problem solving—are intimately intertwined with factual knowledge that is in long-term memory," Daniel Willingham writes. "Most people believe that thinking processes are akin to those of a calculator. A calculator has a set of procedures available (addition, multiplication, and so on). . . . If you learn a new a new thinking operation "for example how to make inferences, 'it seems like that operation should be applicable to all' such settings. But the human mind does not work that way. . . Critical thinking processes are tied to background knowledge."[37]

Somehow this fact does not seem to be getting through to schools. Perhaps it's the chimerical nature of skills-based instruction. We just can't let go of how beautiful it would be if we could just give students a super skill, a universal key, and the hours we spend chasing that dream is time taken from far more productive tasks.

Again, we don't blame teachers for this. Even at the highest levels of policy, even in schools of education, the misconception prevails.

In his book *Why Knowledge Matters*, E. D. Hirsch tells the story of France, which had among the best and most equitable school systems in Europe before the French replaced their knowledge-rich curriculum with a skills-intensive approach. Results declined steeply overall and gaps between rich and poor students expanded. Scotland followed suit a few years later. It "downgraded the status of knowledge and adopted a competence-based approach, emphasizing the development of transferable skills and interdisciplinary learning," Sonia Sodha wrote in *The Guardian*.[38] The results? Scottish students lost an average of about six months progress in reading on the 2022 Programme for International Student Assessment, which is used to evaluate country's school systems, while inequality increased. The lowest-status group fell twice as fast (a drop of twenty points) as in the highest-status group,[39] Lindsay Paterson, a professor of Education Policy at the University of Edinburgh observed.

You can find a thousand voices on the internet telling us to choose less knowledge and more skills, but even asking what the right balance is between skills and knowledge is the wrong question, education researcher and author Daisy Christodoulou has observed. It is like asking what the right balance is between ingredients and cake. The ingredients become the cake; the knowledge becomes the skill. If you want deeper thinking, if you want better reading, start by building students' knowledge. You can do quite a bit of that if you don't spend hours explaining what an inference is.

Vocabulary Is the Single Most Important Form of Knowledge (But Is Often Taught As If It Were a Skill)

> *Knowledge of words—both deep and broad—is a particularly important form of background knowledge but it is often taught in ways that do not reflect how it is acquired and used.*

Of all the forms of background knowledge, the most important from a reading perspective is vocabulary, and there is a consistent and strong connection between an individual's vocabulary and reading comprehension.[40] Studies typically find strong correlations between the two—between 0.55 and 0.85 according to Anne Cunningham and Keith Stanovich, for example.[41] That is, about half to three-quarters of a student's reading comprehension is explained by knowing the extent of their word knowledge.

Assessing a wide range of causal factors of reading comprehension among ninth graders, Jennifer Cromley and Roger Azevedo found that, "vocabulary and background knowledge made the largest contributions to comprehension."[42] "For any encounter with a given text it is a reader's word knowledge (for as well as meaning) . . . that is crucial to comprehension," write Charles Perfetti and Suzanne Adlof.[43] Some researchers note a tendency toward larger correlations among students with more reading skill and experience,[44] that is, vocabulary may play a growing role in reading comprehension over time and with expertise.

It's worth noting that there's a lot we don't know about the connection between vocabulary and reading and there simply aren't enough good studies (the 2000 National Reading Panel emphasized this point). One common flaw is that studies often successfully establish correlation, but causation is harder to unpack, and it seems likely that what causation exists runs both ways: that better vocabulary leads to better reading comprehension and that better reading comprehension (and certainly doing more reading) leads to stronger vocabulary. Both things are almost assuredly true. This is in many ways a key rationale for the two-part approach to vocabulary (Implicit and Explicit Instruction) that we share in Chapter Five.

Still, studies that look explicitly for causation do appear to show that vocabulary instruction can lead to better comprehension[45] and that students with reading difficulties benefit the most from such instruction (three times as much according to one study)[46].

Another issue is that "vocabulary" is actually a tricky thing to measure. Understanding occurs on a continuum. You can know a little about a word or a lot. A student might have a strong vocabulary as measured by breadth of word knowledge (the number of words they

know) or depth of word knowledge (how well they know the words they know). The net seems to be that breadth and depth both matter deeply (and are surely correlated).

The very simple and basic idea that we started with—that vocabulary is a form of knowledge—is important to return to. In fact, we could probably have simply included vocabulary in our broader discussion of background knowledge. After all, our example of the classroom where students reading *Charlotte's Web* didn't understand what Charlotte meant because they didn't know the word *acrobat* was an example of vocabulary creating a barrier to comprehension. But vocabulary is so important and its role so distinctive in reading that we have chosen to discuss it separately, primarily because teachers often think about and teach vocabulary separately from other things they do to build background knowledge in the classroom.

When they do teach vocabulary, we are often struck by how frequently teachers teach it as if it were a skill, assuming, for example, that inferring word meanings from context is something students can master and apply universally. Another chimera! In fact almost every state assessment in the United States tests vocabulary this way—via Context Clues, that is—so teachers are tacitly encouraged to teach that way as well. In contrast to methods in which the purpose of vocabulary instruction is to arrive (and usually guess at) the definition, we argue that a good, student-friendly definition is the starting point, not the end point, of effective vocabulary instruction.

In Chapter Five we discuss the ramifications of this more extensively: starting vocabulary instruction with a definition and then asking students to engage in what Isabel Beck and colleagues call "thought-provoking interactive playful follow up."[47]

We've also broken out vocabulary as its own topic because where and when challenging words are likely to occur is also important. The short answer is: in print. Almost exclusively.

Stanovich and Cunningham analyzed the number of rare words that appeared in various formats of print and speech. When college graduates speak to other adults, they use about seventeen rare words per thousand, for example, and the median word they use—measured for how common or unusual it is—is the 496th most common word in the English language. Prime time television, which we might use as a proxy for broadcast media more broadly, is similar in its characteristics: there are about twenty-three rare words per thousand and the median word is the 490th most common in the English language.

To get a sense for what these numbers mean and why they are important, compare that data to the same measures of the language used in a typical children's book. Though produced for children rather than an adult audience, a children's book is far more sophisticated in its vocabulary, featuring thirty-one rare words per thousand on average with the median word checking in as the 627th most common.

"Children's books have 50% more rare words in them than educated adults use when speaking aloud," Stanovich and Cunningham note.[48] In fact, *even preschool books have a higher median word rank than adult conversation*.

Now consider the data for books written for adults. There readers encounter fifty-three rare words per thousand and the median word is the 1058th most common. In newspapers there are sixty-eight rare words per thousand and the average word is the 1690th most common. For abstracts of scientific articles there are 128 rare words per thousand and the median word is the 4,389th most common in the English language.

Prevalence of Rare Words in Various Spoken & Written Language Sources
(adapted from Cunningham & Stanovich 1998)

	Rank of Median Word	Rare Words per 1000
Printed text: Abstracts of Scientific Articles	4389	128
Printed text: Newspapers	1690	68.3
Printed text: Popular Magazines	1399	65.7
Printed text: Adult books	1058	52.7
Printed text: Children's books	627	30.9
Printed text: Preschool books	578	16.3
Primetime adult television	490	22.7
Adult speech (College graduates to friends/spouses)	496	17.3

A 2022 study by Oxford psychologist Kate Nation and colleagues stuck a similar theme. "Exposure to book language provides opportunities for learning words and syntactic constructions that are only rarely encountered in speech and . . . in turn, this rich experience drives further developments in language and literacy."[49]

What does this tell us? First that exposure to spoken language, even fairly advanced adult conversation, is inadequate to develop students' vocabulary. "Conversation," Stanovich and Cunnigham say, "is not a substitute for reading."

You're probably familiar with the feeling of knowing what a word means but not being confident in your ability to pronounce it correctly in conversation. This is evidence of words

you've learned exclusively through reading. For example we are still not 100 percent sure whether *forte* is pronounced "fort" or "fortay" and whether ancillary is "AN-sill-ary" or "an-SILL-ary." But we're not embarrassed by this. The fact that we aren't sure means that we learned those words from reading!

Second, while Explicit Vocabulary Instruction—choosing and teaching words deliberately—is immensely valuable, *most of the words a student learns in their lifetime will be learned via encountering them in their reading*. This means that if we want students to learn new words, it is important that we have them spend a lot of time reading. As they do that, we can help them to learn more words if we use intentional strategies to cause them to notice and learn more from the words they encounter as they read.[50]

This is not to say that spoken language is irrelevant. A 2023 study by Jeanne Wanzek and colleagues showed that when teachers intentionally use advanced vocabulary while teaching, it makes a big difference. "The proportion of academic words used by teachers during the school day significantly predicted students' end-of-year vocabulary. Teachers who used more academic words had students with higher vocabulary achievement at the end of the school year," they note.[51] So how we talk to students also matters. Again, the research suggests to us that we need vocabulary *methods*, not a single method—learning words is something we need to attend to in a variety of settings. But we also need to be thinking about exposure and how to make more attentive exposure to a wider range of words a regular part of our teaching.

Knowing a word, we noted, is multileveled thing, and knowledge of specific words is "learned incrementally and refined over time," as Gene Oulette and Emma Shaw point out.[52] This is important for teachers to recognize because the nuances are what matter in reading.

Imagine you're reading a scene about two students walking home from school and find this sentence:

> *On the way home Shauna mimicked Ms. Groves, saying, "I'm really proud of you, Kayla."*

Perhaps you know that the word *mimic* means something similar to imitate. In that case, you would get the general gist of the sentence. But if you know that the word *mimic* also suggests imitating in order to ridicule and entertain, then you understand the sentence much better. Shauna *imitating* Ms. Groves could mean a lot of things. Perhaps she is rehashing some happy moment of success that Kayla achieved. But Shauna *mimicking* Ms. Groves is much more charged. A story of resentment and sarcasm starts to take shape. Your depth of

reading the passage hinges on your understanding the depth of the word. You cannot interpret something you don't notice.

We find examples such as this one especially interesting because one common approach to teaching vocabulary is to introduce a word such as *mimic* and provide a simple synonym for it: *imitate*. And indeed, the two words' meanings overlap to a large degree. If my purpose is a very general understanding of the word *mimic*, providing a synonym may be helpful. But if my goal is to help you use the word *mimic* as a reader, then the differences are just as important. If two words meanings overlap by 80 percent, it is the 20 percent that is different that matters most when I encounter one of them in a text.[53]

Teaching a simple synonym-based definition is unlikely to lead to perceptive reading. As Isabel Beck, Margaret McKeown, and Linda Kucan point out in *Bringing Words to Life*, depth of word knowledge correlates almost as strongly to reading as breadth of knowledge. "Studies have demonstrated that people with more extensive vocabularies not only know more words but also know more about the words they know, and that people with high and lower vocabularies differ as to their depth of knowledge about even fairly common words,"[54] they write. So when we teach words we need to think about both quality and quantity of understanding.

Teaching words is often given short shrift, we think. It's a nice to have in many classrooms rather than a bedrock of learning. And while we think the research tells a clear story, we'll let W. H. Auden have the last word. "Language," he wrote, "is the mother, not the handmaiden of thought."[55] What words you have available to you do not merely reflect what you think, they shape it. You see what you know, and you know what you can name. In many ways it is difficult even to conceptualize something you don't have a word for.

Intentional Writing Development Can Play a Critical and Synergistic Role in Developing Better Readers

> *Done carefully, writing in response to reading can assist in memory formation and help students develop mastery of the written code that reading relies on. Short exercises that can be easily and quickly revised and that intentionally develop students' control of syntactic forms are especially useful.*

Reading and writing are in many ways two sides of the same coin. To write is to produce ideas via the same system of language we use when reading. As students get better at creating and producing with writing—and especially syntax—they also get better at understanding

and perceiving the nuances of language and syntax when others use them. You can improve your knowledge of the code by studying it from productive and receptive angles.

But writing might help improve reading even if we used different systems for it and for reading—if we read in Japanese and wrote in English, say—because it fosters memory formation and can slow and deepen thinking.

There are multiple connections between reading and writing, this is to say, so it's not surprising that research indicates that between 50 percent and 70 percent of the variation in reading and writing abilities are shared.[56] That is, if we understand how well a student writes, we can predict half to three-quarters of their reading skill level. And while this connection describes a correlation, not a causation, perhaps the most comprehensive summary of research on writing in literacy classrooms, the Carnegie Corporation of New York's 2010 report *Writing to Read*, provides evidence that whether students write (and more importantly how they write) can directly affect reading outcomes. "The evidence shows that having students write about the material they read does enhance their reading abilities," the study noted, with fifty-seven out of sixty-one studies reviewed yielding positive effects. "Writing about a text proved to be better than just reading it, reading and rereading it, reading and studying it, [or] reading and discussing it," the study added. Further, "the impact of writing about reading applied broadly across different levels of schooling. These positive effects were evident when students wrote about text in science and social studies as well as in English."[57]

Writing summaries of texts was one especially valuable form of writing, the report found. "Transforming a mental summary of text into writing requires additional thought about the essence of the material, and the permanence of writing creates an external record of this synopsis that can be readily critiqued and reworked. For students in grades 3–12, writing summaries about text showed a consistently positive impact on reading comprehension."[58] So writing in response to text and especially summarizing it, can help build memory and understanding. This is particularly true for lower-achieving students: "In twelve studies involving such students, the average weighted effect size for writing about a text was 0.63," the study reports.[59]

Students annotating as they read also demonstrated consistently positive effects across studies. The average weighted effect size of note-taking was 0.47 across twenty-three studies, the report reveals, though it also notes that what "note-taking" meant varied widely across the studies. We share further thoughts on annotation in Chapter Two.

But the strongest findings from the Carnegie report dealt with explicitly teaching students to use syntactic forms to express ideas via an expanding range of structures. The best writing exercises for developing students' reading abilities were often those where students

were explicitly instructed in how to use specific writing forms effectively. This is a note Judith Hochman and Natalie Wexler sound repeatedly in their book, *The Writing Revolution*. American teachers assign writing a lot, but they don't teach it, deliberately and intentionally, nearly as much. It's this piece that often delivers the value.

This is because the prior knowledge students need to read successfully includes not only *background knowledge* about the text and its subject matter, not only robust *word knowledge* (that is to say, vocabulary), but also *syntactic knowledge*: an understanding of arrangements and constructions of phrases, clause, and sentences. This form of knowledge is often overlooked and is a frequent barrier to understanding. Students who struggle to read are often undone by complex or unfamiliar syntax—by a compound subject, by a subject a long way from its object, by the subordination of one idea to another.

For example, a student may have experienced only the comparatively narrow range of sentence constructions familiar to contemporary writing, especially that which tends to appear in youth fiction. To such a student the opening line of a book like Jane Austen's *Pride and Prejudice,* which describes not a "universally acknowledged truth" but a "truth universally acknowledged" that a single man "in possession of a good fortune" must "be in want of" (that is, need) a wife, is likely to be as problematic for its advanced syntax as much as or more so than for its advanced vocabulary.

Being able to create increasingly complex sentences with precision and accuracy helps student to master syntax: to have enough knowledge of it to support their reading and enough control of it to empower their writing. These work in synergy. Students who write repetitive and wooden subject-verb-object sentences are the same students who are likely to struggle when asked to read a sentence that, like the one you are reading, uses a variety of unfamiliar and unusual forms such as compound subjects to express the relationship between and among ideas.

Indeed, the Carnegie report gave particular notice to the benefits of writing instruction that involved intentional tools such as sentence combining for developing syntactic control[60] (the ability to use forms of grammar and syntax to create sentences that capture a wide range of complex ideas).

The report found significant evidence—with an average effect size of 0.79, albeit across only four studies—for the benefits of intentional instruction in sentence construction skills. It notes, for example, that "the practice of putting smaller units of writing together to create more complex ones should result in greater skill in understanding such units in reading" and that "teaching patterns for constructing sentences or larger units of text should improve reading skills."[61]

This also jibes with the science of deliberate practice. Just assigning lots of writing won't cause students to expand their ability to use complex forms to capture complex ideas. To be effective, writing instruction has to show students how to use syntax and give them extensive opportunities to employ those tools in a controlled setting, with attention directed to the forms of language teachers want them to master.

A last benefit to writing is worth touching on here. Teachers should always be aware of loads on working memory. When working memory is overloaded people forget what they are thinking about and perceive less in their environment. One way this often shows up in classrooms is during discussions about books. If students are trying to hold their own thoughts about a story in their minds while their peers are talking, their working memory will likely be overloaded if they also try to listen intently. They will have to choose between listening fully and trying to remember what they were thinking. If we give them the opportunity to jot down their thoughts before a discussion, however, we help them to unburden their working memory and put their thoughts in a place where they can simply and easily review them later as needed.

Books Are the Optimal Text Format Through Which to Build Understanding and Comprehension

> *Books package information and ideas in a unique form to which our brains are especially receptive. They create arguments of depth and nuance in ways that are critically important to read in a digital society that reinforces "hot takes" and facile opinions arrived at quickly. Moreover books provide the best opportunity to create for students the sort of shared social experience that is critical to their sense of belonging in schools.*

We are "unapologetic about the book," by which we mean that we think a good reading program should be built around students reading the best books we can find for them, in their entirety, and most often together as a group.

What's the big deal about books? Why do they matter and what is the science that supports reading them over, say, passages or stories or even YouTube videos (which, as of 2023, the National Council of Teachers of English was shamefully advocating for more of in reading and English classes)?

A phrase from the social theorist Marshall McLuhan's 1975 book *Understanding Media* has proven one of the most enduring and important observations about human communication.

The medium, McLuhan observed, is the message; every means of communication shapes the way we see the world. It is, in the words of Johann Hari, "guiding us to see the world according to a new set of codes."[62]

Part of the implicit message of social media platforms is that, as Hari puts it, "the world can be understood in short simple statements of 280 characters," and "can be interpreted and confidently understood very quickly." [63] All around us we see evidence of this message taking root. A cacophony of hasty and simplistic world views are shouted back and forth.

By contrast, Hari writes, "the medium of the book tells us, that . . . the world is complex and requires steady focus to understand; it needs to be thought about and comprehended slowly."[64] First impressions turn out to be wrong. The truth is complex and nuanced. Nothing instills an idea of the world as a complex place demanding deep understanding like a book does because a book is almost always an extended narration on this idea. A book always involves a change in thinking about the world. If there is a hope for our increasingly fractious society, it lies in part in students learning that lesson.

We also learn especially well from stories. Cognitive psychologists often describe them as "psychologically" or "cognitively privileged." Researchers find that people remember ideas and insights better when they encounter them in a story. We remember the facts because they are connected to a story and the more memorable and compelling the story—the deeper our relationship to it—and the more context we have to understand it, the better. This is one unique power of books.

Stories also improve people's capacity for empathy, their ability and desire to understand what other people think and feel, and the longer and deeper the story the greater the benefits. When you build a relationship with a narrator and care about him or her, you are primed to build memory and understanding.

This is the power of historical fiction in particular. We remember the facts because we are connected to the story. If background knowledge is critical to comprehension, books are a powerful place to get it, and to get it in the sustained, connected webs of understanding (called *schema*) that most aid us in comprehension.

Finally, books are the format in which the important ideas of society have been transmitted for centuries. The world is full of allusions and references to ideas contained in books, so it is a gift to students whom we want to be full participants in society to let them be party to the shared knowledge they contain.

But books can be hard. They are often old, written in the parlance of a bygone era. They are often complex, occasionally even resisting the efforts of readers to make easy meaning of them.

This is beneficial. Students should learn to be comfortable struggling. The only way to sustain access to the ideas encoded in the history of books is to struggle with archaic syntax, say, and to read it two and three times until its style becomes more accessible. If students never read text that is more than, say, fifty or a one hundred years old, the writing of the past will increasingly slip further and further away from them. Do we want a society where students lack the familiarity with outdated writing and the mindset to persist at the challenges it presents? Our next and final principle of reading instruction will discuss how complex text is the gatekeeper to future success and books are the best source of many of the forms of complexity students require exposure to and experience with. Decisions in society are especially likely to be entrusted to those who can access its most complex texts. We can't imagine it will be a good thing when only a small number of experts can read directly from *Origin of Species* or the Constitution of the United States.

How does this pro-book vision contrast to what English and reading classes are based on today? What are schools doing if not reading books? Why does one even need to make the case for the book?

There are several alternative models to book-based literacy instruction prevalent in K–12 classrooms today. One is what we might call "passage-based" reading instruction. In this model, which often goes hand in hand with the belief that reading is made up of transferrable skills, reading consists of a series of short passages, a different one every few days, with the passages chosen and organized based on the "skills" they enable teachers to instill. So, if we're working on being able to explain the main idea, we'll read an "interesting" passage about cooking empanadas and tomorrow we might read one about the American Revolution. The unifying theme is that the teacher is asking students to find the main idea in each of these passages.

In some versions of this model, the class might read a novel like Lois Lowry's *The Giver*, but mostly as a device to present main idea questions to students, rather than to reflect on humanity, free will, and society. The book is passage-ized. And nothing kills a book faster than making it a tool for strategies practice, and nothing is less likely to help students become effective readers.

Another alternative is the "choice-based" model. In these classrooms students do read books but each student chooses and reads their own book on the premise that students will be more motivated if they choose what they like. Beyond the fact that this presumption is questionable (a student who has read a handful of books is unlikely to choose something great, something that changes her world view, something that causes her to see the world differently, whereas an well-read adult is well positioned to do so), a key part of the experience of a book is lost when it isn't shared. We benefit from discussions in which we hear different

interpretations and reactions and come to change our point of view, and we benefit from being connected through sharing the experiences and emotions a book provides and elicits.

We want to be clear in expressing these reservations about "choice" as a tool to promote reading. We are not talking about limiting students' choice in their independent reading. We are all for encouraging and assigning independent reading beyond what happens in class, and we're all for students choosing what interests them. But in class, in the reading that makes up the core of our curriculum, we think the benefits, in terms of shared experience and motivation to read, are strongly on the side of shared books chosen and curated carefully by teachers. In part this is because, in an era when social media disconnects and isolates young people, books can connect them through a shared experience of reading together, and in part because we think experiencing the best books through the eyes of a teacher who can bring them to life most likely will help students to develop as readers, most likely will expand their conception of what books can be, and most likely will motivate students to become more consistent readers.

Given that precious few kids are reading books at all—on their own and in the classrooms—it is ironic that there's so much *sturm und drang* about book choice and book restriction. Even college professors report difficulty in getting students to read books when they are assigned. What if this sad state of affairs is not the cause, but the result, of how much a love of reading has been driven out of our K–12 classrooms, where we've failed to light students' minds on fire and maximize their learning by giving them interesting and important books to read?

For these reasons we are "unapologetic about the book": we believe that even—perhaps especially—in a digital age, books create a critical experience that can be created through no other means. Ensuring that students read books—excellent books, whole books, together in groups, often aloud to maximize the sense of connection they create—will maximize the chances that they become better readers, more knowledgeable students, and that they come to love and value reading.

The Ability to Read Complex Text Is the Gatekeeper to Long-Term Success

> *Asking students to read only texts that are readily accessible to them can seem sensible and supportive in the short run, but in the long run students must learn to read challenging texts and become comfortable struggling to make meaning.*

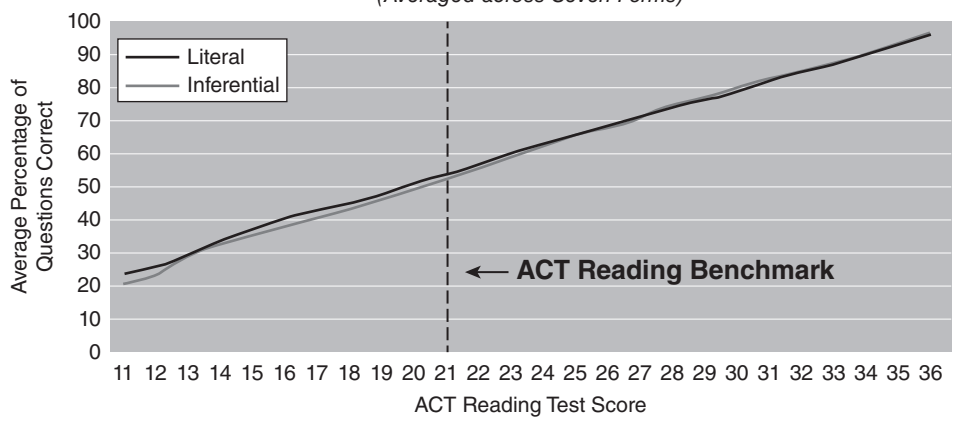
A 2006 study by the makers of the ACT, one of the two major college admissions tests in the United States, provided a series of crucial insights into the skills and experience of students who'd taken the test. The report revealed that only about half of ACT test takers were prepared for college based on their reading skills. Worse, they found that the number of students who were on track to be "college ready" appeared to diminish between the eighth and twelfth grades. Something was happening—or NOT happening—in high school that caused thousands of students to slide out of the zone of likely success.

The analysis studied the results of more than a million ACT test takers. Researchers first determined what ACT score predicted college success. A 21 on the Reading portion of the ACT indicated "the level of achievement required for students to have a high probability of success . . . in such college courses as Psychology and U.S. History," with probable success defined as "a 75 percent chance or better of earning a course grade of C or better [and] a 50 percent chance of earning a B or better."[65]

Researchers called this the "college-ready benchmark." Achieve a score of 21 and your chances of persisting and succeeding in college were strong. Fail to meet that score and the chances that you would struggle to stay in school or in the major you chose were higher. "Poor readers struggle to learn in text-heavy courses and are frequently blocked from taking . . . more challenging courses," the study's authors reported. They meant extra, remedial courses that did not provide graduation credits. Poor reading skills were a financial tax on marginal students, extending their time in college and increasing the amount of fees and loans required.

So what was the key to scoring a 21? The test makers ran a series of analyses. First they tried to discern whether the ability to get beyond literal questions and to think inferentially was the problem. Here's the difference in the number of literal and inferential questions test takers typically got correct for each score on the ACT:

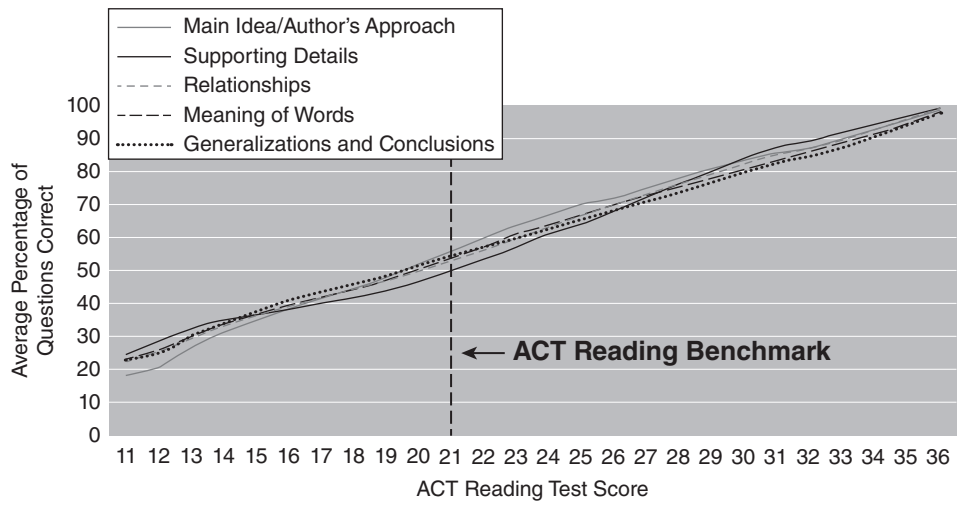
Performance on the ACT Reading Test by Comprehension Level
(Averaged across Seven Forms)



As you can see, there is almost no difference between how test takers of any level perform on literal versus inferential questions. If you were a strong reader or a poor reader you essentially did exactly the same on both types of question. Inferential questions were no more of a challenge to weak readers than literal questions.

When the test makers disaggregated scores by question type—that is by the "skill" they were assessing—they again found little differentiation. There's not much difference in how a typical test taker, strong or weak, does on a main idea question as compared to a question about supporting details.

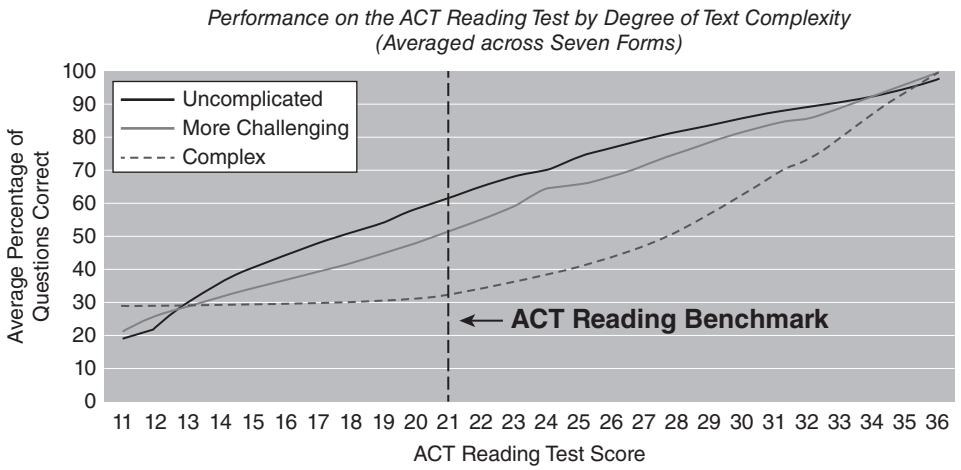
Performance on the ACT Reading Test by Textual Element
(Averaged across Seven Forms)



"Given these steadily increasing linear relationships between ACT Reading Test score and reading proficiency, there is no clear differentiator here between those students who are ready for college-level reading and those who are not," the study observes.

We take particular interest in this analysis since it provides additional support for the idea that these sorts of transferable skills are in fact discrete competencies. If these five different types of questions really represented different "skills" everyone would not likely be equally competent at all of them. But we don't see any differentiation in how students scored on them at any different level of proficiency, suggesting that perhaps they aren't discrete skills after all.

The next analysis the test makers ran, in which they disaggregated performance by the difficulty of the text in the passage, was far more revealing, however. Here's the data:



As you can see, when questions were assessed by the difficulty of the text in the passage, dramatic differences in test-taker performance emerged. Students who were at risk of not reaching the benchmark were especially likely to struggle when asked to read complex text. In fact, with an average of 30 percent correct, these students tended to perform little better than if they had been guessing, given that the test is multiple choice. They were stumped when passages did not yield meaning easily. Weaker students could not read fluently, perhaps. Or they could not unlock the syntax. Or maybe they weren't familiar with the experience of struggle with resistant text.

In the words of the test makers, "performance on complex texts is the clearest differentiator in reading between students who are likely to be ready for college and those who are not." The ability to read difficult text, out of your comfort zone, was the gatekeeper. What's more, the test makers noted, "This is true for both genders, all racial/ethnic groups, and all annual family income levels."[66]

This might offer one explanation why students were dropping out of the "prepared for college" zone as they went through high school. They were not exposed to difficult text, did not learn to grapple with text that resisted easy meaning-making, and were not able to track complex syntax and vocabulary. It is very, very hard to be prepared for college and advance knowledge work unless you can do those things.

That said, the idea of textual complexity lacks a consistent definition. Sentence length could be a factor (longer sentences might place more demands on attention and working

memory), complex or unusual syntax might be a factor, so might vocabulary. But no one knows for sure. As Tim Shanahan notes, "while shorter sentences tend to be easier to comprehend than long sentences, there are many exceptions to this correlation. If sentences are shortened to omit explicitly stated causal connections, for instance, the brevity tends to reduce understanding more than it facilitates it."[67]

Commonly used measures of complexity are also unreliable. You might expect a measure like Lexiles to be helpful in identifying difficult text but there are also quite evident gaps in using it—or any algorithm—as the primary arbiter of complexity. William Golding's *Lord of the Flies* and S. E. Hinton's young adult novel *The Outsiders* both score about the same in difficulty according to the Lexile framework, but as we discussed in *Reading Reconsidered*, there is no comparison between the texts in terms of difficulty. *Lord of the Flies*, full of complex archaic syntax, complex symbolism, and allusions to mid-twentieth-century British culture is incomparably more difficult. We have never met a teacher who knows both books and did not agree with this assessment.

That said, despite the difficulties of measuring complex text, we think research suggests it is a critical factor for teachers to be alert to.

"The type of text to which students are exposed . . . has a significant impact on their readiness for college-level reading. Specifically, students need to be able to read complex texts if they are to be ready for college," the authors of the ACT study write. "In a nation where 13- and 17-year-olds have increasingly less exposure to or interaction with books outside of the classroom . . . schools must still play the primary role in providing students with the kinds of complex reading materials and experiences they need in order to be college and work ready." [68]

Interestingly, the importance of text complexity also emphasizes the critical role of background knowledge in teaching reading. Researchers use the term *coherence* to describe "the extent to which the text provides information and clues to help the reader relate information across different parts of the text." A low-coherence text tends to be more complex because, as Reid Smith and colleagues note in their literature review, "a reader facing a low-coherence text needs to rely more heavily upon their background knowledge to help fill the coherence gaps by making inferences."[69] The most challenging texts, the gatekeepers to the next steps in a student's journey, are the most reliant on background knowledge. In Chapter 8, we discuss how close reading can help students master complexity with confidence.

"THE SINGLE MOST IMPORTANT THING FOR TEACHERS TO KNOW"

The seven arguments we've described in this chapter each align to a chapter in the book. In Chapter Two we discuss attention and how to rebuild it. In Chapter Three we discuss the ways

to read in the classroom—aloud by the teacher, aloud by students, silently by students—and how to use the different ways of reading to build fluency among other goals. In Chapter Four we discuss how to organize lessons around knowledge instead of transferrable skills. Chapter Five takes on the topic of vocabulary—a critical topic for teachers in every discipline, we note. Chapter Six discusses writing, including the ways writing can be used to increase reading comprehension for students. Chapter Seven is a deeper discussion of books, including more about why, which ones, and how to choose them. Chapter Eight is about Close Reading, which is the strategic use of rereading and other techniques we describe in this book to help students confidently unlock complex text.

But there is one more body of research that is critical for teachers to understand and that is referenced in almost every chapter—including this one. That topic is cognitive load theory: the science of how working memory, long-term memory, and perception interact in the mind of the learner. Dylan Wiliam has called it "the single most important thing for teachers to know."[70] Its implications are far-reaching and help teachers understand almost every aspect of what students do when they learn generally and learn to read specifically. So while cognitive load theory doesn't get its own chapter, that's only because its relevance is everywhere. And because that everywhere includes the chapters of this book, we propose to summarize it with the other research we've discussed.

Understanding cognitive load theory starts with understanding the idea of working memory. "Working memory is . . . the mental space where we place information we are thinking about, whether it comes from the environment, our memories and knowledge or both at the same time," writes Héctor Ruiz Martín.[71] When we are intentionally trying to remember something that we have just heard, like a phone number, say, we must hold it in our working memory to be able to then use it to dial someone. But we don't just hold information in working memory. We think about it, and our working memory gives us the capacity to manipulate and analyze ideas we hold there to develop understandings about them to a degree that has no comparison in any species the planet. High-order thinking, logical analysis, all of the key cognitive abilities that make humans unique are in large part products of working memory.[72]

A decent synonym for working memory is *conscious thinking*: if you are aware that you are thinking, you are almost assuredly using working memory.

Working memory is powerful in helping us to understand complex phenomena but the understanding it helps us achieve is not learning. Only when ideas are transferred from our working memory into long-term memory can we be said to have learned, Paul Kirschner, John Sweller, and Richard Clark point out. They define learning as "a change in long-term

memory" and add that "The aim of all instruction is to alter long-term memory. If nothing has changed in long term memory, nothing has been learned."[73]

This is a profoundly important observation with important implications. First, it means that when we see understanding and insight among students in the classroom, what we see is not yet learning. It may be forgotten. In fact most of what we think about in our working memory is forgotten and therefore not learned.[74] If the phone number you are trying to remember is really important, you will probably start repeating it to yourself. This is because you recognize a key flaw in your own working memory: it is fragile. It's so easy to forget what you're holding there if you don't concentrate on it. Maybe some friends are talking in the background as you try to remember that phone number and this makes the prospect of remembering it doubly tenuous. You can feel their incessant talking disrupting your ability to remember the number. Another challenge: working memory is tiny. Phone numbers around the world are seven digits maximum because people cannot generally hold more than that much information in working memory. If you begin to pay attention to what your friends are saying—a difficult thing not to do—your working memory, already at the limits of what it can hold in trying to remember the digits be overloaded. You will forget the number. Possibly you will start to get anxious. Maybe you will bark at your friends: *stop talking I need to remember this number*. Hopefully they understand that working memory overloads are stressful and will forgive you.

You might think, given all the things we try to remember, that we'd have evolved over time to remember more of what's in our working memory but in many ways its fragility is a design feature not a glitch. You use your working memory for thousands of things every day that you don't wish to remember: you are reading the menu at a restaurant and have to hold in your working memory the descriptions of two things you might wish to order. As you hold on to the descriptions of them you must compare them—which sounds better? Healthier? Which are you less likely to spill on your shirt and cause your dining companion to be unimpressed? You have no wish to remember your deliberation and decision about the pasta puttanesca in the future. For this reason, your brain is designed to dump most of what you hold in your working memory.

So far cognitive load theory has told us some really useful things. The part of your brain that thinks consciously about ideas and generates understandings is powerful but small. When what you're trying to use it for is more complex than strings of numbers, you can really think about one or two things at a time. If you overload it and try to do more than that, you will almost assuredly forget, which is to say, fail to learn because learning is a

change in long-term memory. And the process of overloading your working memory will likely be unpleasant.

But working memory has more functions than just conscious thinking. It is also the primary means by which we encode things in long-term memory. This might sound like a contradiction. We forget most of what we use working memory to think about but working memory is the tool of remembering? Strangely, yes.

One of the saddest things about being a human being is that we cannot control our own memories. We cannot simply decide to learn something, no matter how important. A study by T. S. Hyde and J. J. Jenkins established this in 1973. Participants' intention to remember information had very little effect on their ability to do so.[75]

We cannot simply decide to remember something, but interestingly, the way we use our working memory to think about it can change the odds of remembering it. The basic rule is that desirable difficulty causes learning. The term *desirable difficulty* comes from UCLA cognitive psychologist Robert Bjork.[76] Working hard to think about a learning object causes us to remember it better, Bjork proposed.

Summarizing this idea, Daniel Willingham writes, "Memory is the residue of thought."[77] If we can get students to think hard about an idea[78] we maximize their odds of encoding it in memory, with encoding being the first of two steps necessary to remembering something. (We'll come to the other, retrieval, in a moment.) Let's say a teacher asks students to make a poster about a book they've read in class. Is this a good learning activity? Willingham suggests asking about the task: "Does it demand deep understanding or is it possible to complete it with just a surface knowledge of the material?" The important question will be: how much does the assignment cause students to spend time thinking hard about the book—its meaning, its language, the historical context—and how much does it cause them to think about the construction of a poster: cutting out images to paste to the poster, writing headlines in large letters, and so on. Making a poster may be engaging—that is, students may enjoy doing it—but it does not necessarily cause students to think hard about the book. Some parts of the task will allocate time to things that don't result in learning.

Héctor Ruiz Martín summarizes this idea: "The more deeply we process information in terms of meaning, the more firmly it is [likely to be] rooted in our memory." But, crucially, he adds, "Thinking about something in terms of its meaning involves associating new information to our prior knowledge ... . The more relationships we establish with our prior knowledge while reflecting on the learning object, the more solid its assimilation will be." In other words, a key part of desirable difficulty is building connections between the learning object and what the learner already knows. The more such connections are built, the better.

Learning, Ruiz Martín says, requires "a connection between prior knowledge and new information fostered by the effort to make it meaningful."[79] This also provides an explanation for much of the research we have cited on the importance of background knowledge to reading. Without relevant concepts to connect new information to, learning is difficult.

Learning is likely to happen when we focus students' attention on the learning task—getting something into working memory requires attending to it, then thinking about its meaning and connecting it to other knowledge that we have previously learned.

Let us add one more concept to this understanding of how learning happens: the *generation effect* is the principle that there is a "memory benefit for self-generated compared with read or experimenter-provided information."[80] There is a significant advantage in terms of memory when students "generate" some version of the content they are learning.[81] When students describe a phenomenon or idea in writing or when they explain it briefly to a peer it helps them to remember it. Students who sit silently in class, are not as likely to remember and learn as are students who are caused by teacher's actions to actively engage in the content they are learning—by summarizing it or rephrasing it or explaining it or making a connection to it—either verbally or in writing. This is true regardless of their motivation. "High internal behavioral engagement did not guarantee student achievement if the engagement was not accompanied by talk," K. Sedova and M. Sedlacek concluded in a recent study of Czech students.[82] Very few people have the self-discipline to self-generate a version of what they are learning without an environment that causes it to happen. Further, by beginning the process of encoding, self-generation also probably unburdens working memory, which makes students more receptive to more new information.

This process of self-generation should be guided and directed by the teacher, by the way. In the majority of cases, the expert should shape the question that students use to reflect. "The best results are obtained when the teacher guides . . . the experiences and directs the reasoning and reflection of the students," writes Ruiz Martín.[83]

One other note about working memory is important to address here: its role in perception. We process the world around us first with our senses and then usually with our working memory. This means that if working memory is overloaded, perception will likely be degraded. New York State, where the three of us live, has a law restricting drivers from holding cellphones to make calls while driving. On some levels this is a very good law. When you are talking on the phone you are far more likely to have an accident because when you are using your working memory to hold a conversation, your perception is degraded. You are less likely to notice a vehicle in your blind spot or the sharpness of a curve in the road.

But a hands-free cellphone law is only partially effective. Holding your phone isn't the biggest problem. You can drive perfectly well with a cup of coffee in your hand. What you need to be a safe driver is free working memory. Having a conversation hands-free is still a risk.

As we discussed previously, this explains why dysfluency is so problematic. When you can't read at the speed of sight, the process places a heavy load on working memory. Making sense of what is written becomes more difficult and students fail to perceive things about the text that might otherwise be obvious to them. Reading, this reminds us, is fundamentally an act of perception.

This is also why we will refer multiple times in this book to the transient information effect. "The transient information effect occurs when explanatory information disappears before it can be adequately processed and leads to inferior learning than more permanent sources of information," write Singh and colleagues.[84] If we can't look at what we are trying to think about, we have to use a great deal of our scarce working memory capacity simply trying to remember it and hold that recollection in our heads. If, however, the subject of our analysis is placed where we can see it and constantly review it, thereby refreshing it in our working memory, we don't have to spend scarce cognitive resources trying to remember the thing we're talking about. We have more working memory to analyze, perceive, and learn. When we are talking about especially demanding tasks like Close Reading sections of complex text, whether the passage under study remains easily in view of learners is a big deal.

Previously we noted that encoding—transferring ideas from working memory to long-term memory—was the first of the two-step process of learning something. Let us conclude our discussion of cognitive load theory with a brief discussion of the second step: retrieval.

Once something is encoded in our long-term memory we can potentially recall it with no load on working memory. This is an incredibly important observation because it means we can instantly connect something we perceive to a great deal of information and make sense of it quickly. We can read a line by a narrator and recognize that it alludes to the fence-painting scene in Tom Sawyer, that it sounds like Toni Morrison's writing, or that its tone is ironic. If a student said those things in our classroom we might perceive them to be examples of outstanding critical thinking but in fact they are really linkages between perception and knowledge in long-term memory. "Much of the time, when we see someone apparently engaged in logical thinking," Willingham writes, "they are actually engaged in memory retrieval."[85]

This also tells us that using concepts or information we have learned requires both encoding in and retrieval from long-term memory, and these are separate processes. Students are best able to use knowledge when both encoding and retrieval strength are strong. We've talked a bit about what causes strong encoding—the more connections to other knowledge

in long-term memory the better—but not about what causes strong retrieval. The answer there is Retrieval Practice: the process of recalling previously encoded information back into working memory after a period of forgetting.

There is vast research on the science of retrieval so we will give it only the briefest gloss here. To be able to use information to assist in thinking, research suggests that students need to encounter it multiple times with the retrieval spaced over intervals of increasing duration.[86] As we discuss in Chapter Four, designing knowledge-rich reading environments involves planning for and implementing Retrieval Practice: with vocabulary, with story elements—reading a book is a lot to remember—and, via knowledge organizers, with key background knowledge.

The speed with which we can use knowledge once it is deeply encoded in our long-term memory is nothing short of remarkable. In a flash an expert—someone with broad knowledge of a topic deeply encoded—can see a stimulus and understand its meaning with something like prescience. A quarterback in the NFL is a good example. In the blink of an eye a successful quarterback can glance at the defense and—under intense pressure—predict their actions and the decisions that will yield success. If he can't do this, he's not going to be a quarterback for long.

One of our favorite examples of this was provided by Dallas Cowboys quarterback turned television analyst Tony Romo. During the 2019 AFC Championship game between the New England Patriots and the Kansas City Chiefs, Romo was describing the action on a critical fourth and one for the Patriots. As the Patriots were settling into their formation Romo breathlessly announced, "They're killing it! This [the formation the Patriots were in] usually means 'motion' and run outside to the right!" Seconds later the Patriots sent a player in motion and ran right for a touchdown.

But there is a downside to this remarkable capacity for insight. The curse of knowledge (sometimes called the curse of expertise) is the idea that once you are an expert, what you understand comes so quickly and seems so effortless that it can be very difficult to recognize the degree to which a novice won't understand or perceive all—or any—of the things that seem quite plainly intuitive to you.

A teacher of course is an expert—or at least far more expert than her students. Which means that it will be difficult for her to recognize what they won't understand. She will read a passage in the book and it will be "obviously" ironic to her. Not only is there a good chance that that irony will not register with her students, but the recognition may come so Tony-Romo-fast to her that it will be difficult for her even to be aware of their confusion. She may assume they see what she sees. She may assume they understand when they don't. For obvious reasons then a teacher must always strive to be aware of the curse of knowledge.

BUT WILL STUDENTS DISLIKE IT?

We promised previously to respond to the concern that teaching in accordance with the research we've described here will be less engaging and joyful, and that building lessons using background knowledge and complex texts, say, will create stultifying Gradgrindian classrooms and demotivated students.

Ironically, we think the opposite is true. We're confident of it in fact. And we think the research supports us.

Curiosity, for example, is helpful for both motivation and memory. Héctor Ruiz Martín notes that in one study, students recalled 30 percent more information when their curiosity was engaged during the initial learning process. But, Ruiz Martín notes, curiosity is also connected to knowledge. "The more prior knowledge we have about something, the easier it is to learn about related things," he writes. "Learning occurs by making connections between prior knowledge and new information. Hence, the more knowledge we have about something, the more connections we can make."[87] In the aggregate you are more likely to feel curiosity when you know more about a topic because you see more interesting connections. Of course, you probably can think of times when something new sparked your interest, but more often something you can connect to other things you know about is most likely to engage your interest.

This is fascinating because somehow thousands of educators have been convinced that the opposite is true: that studying facts will dampen curiosity and cause students to find a topic boring. We're not sure how so many came to believe that knowing more about something would diminish our interest in it but the argument is unscientific.

Carl Hendrick and Paul Kirschner remind us that one of the most reliable sources of motivation is success. "What we know from research is this: there's neither a causal relationship nor a reciprocal relationship between motivation and learning. It is learning that leads to motivation. Achievement is far more likely to result in motivation than motivation is likely to lead to achievement. We have the causation backwards."[88]

In part this is because, Héctor Ruiz Martín writes, "when a student faces a learning task, they immediately make judgments about their own ability to complete it successfully. If their perception is that they will not be able to do it, their motivation will plummet."[89] In other words, teaching students in a way that causes them to succeed causes them to be more likely to want to persist in learning. This is why ensuring *successful struggle* (not always but often) is important to creating desirable difficulty.

Video game makers understand this. In fact they call it the *Nintendo effect*. They design games so that players are constantly leveling up, forever seeing clear evidence of their own progress. This ensures their continued motivation to play.

Being taught in a way that causes you to learn more successfully, that causes you to be aware that you are making progress, and increases the intrinsic reward you derive from learning things creates the motivation to learn. Being taught well and seeing the results are the best motivators.

With that in mind we present Christine Torres, fifth-grade English teacher at Springfield Prep Charter School in Springfield, Massachusetts.

The video, *Christine Torres: Brave*, was shot during a lesson on Lois Lowry's novel, *Number the Stars* and shows segments from several elements within the lesson vocabulary, a bit of shared reading, and then a short discussion.

To watch the video *Christine Torres: Brave*, use this QR code or find the video at the URL https://vimeo.com/1058239056/f834f3b677.

Let's start with the vocabulary portion. You don't have to watch much to find yourself struck by the profound level of engagement and enthusiasm of the students in Christine's class. At every question their hands shoot into the air. When there are Turn and Talks to discuss applications of the word *implore* the room explodes to life. Perhaps you suspect we did something to manipulate the setting—promised them all ice cream if they behaved like model students. But honestly, we just rolled up, stood in the back with a camera, and pressed record.

Which is ironic because many teachers dread teaching vocabulary, finding it to be a low-energy activity. They think students don't like it. The evidence certainly appears to point that way. Does anyone know what the word *implore* means, a typical teacher might ask? Can you guess from the context? But when we teach vocabulary that way we make the kind of response we're seeing from Christine's students all but impossible. Half the class has never heard the word *implore* so they have no grounds to guess. It's the same three or four students over and over and often their guesses aren't that good. So the teacher is presented with the choice of accepting a B– definition or, after a period of desultory guessing, telling students what she wished they'd said. Now they might be wondering why they bothered.

Which is why what Christine does is so fascinating. She starts by giving students the definition of the word. Once they've repeated the word and reread the definition and an example, she asks them a series of interesting and playful questions in which they are not guessing at knowledge they don't have but applying knowledge she's given them. And as they do so successfully, their motivation and curiosity build. We discuss Christine's approach to vocabulary more in Chapter Five, but for now be aware that the explosion of student interest in

vocabulary is a response to teaching in alignment with cognitive science. Knowledge, when put to use, is not so boring after all.

The success of the discussion in the second section of the video is also striking. Students' comments are heartfelt and serious. They are all-in for their analysis of Kirsti's bravery. They do not want the conversation to end when Christine cuts it off. It legitimately looks like she'll have takers when she says they can discuss it later with her during down time—maybe recess!? When she tells them at the end of the clip that those who are done early can steal a few minutes to read ahead, one student in the back, pictured here, actually dabs.

In part this engagement is influenced by vocabulary. A few days prior Christine taught students the word *naive*. Can you tell? Of course you can. It's central to their discussion of Kirsti's actions. So is their definition of *bravery*, which comes from a short nonfiction text they read as a Do Now, and which discussed at length what bravery is and how people had thought about it historically. Knowledge again increases engagement and curiosity.

But their motivation to discuss Kirsti is about more than knowledge. It's about connection and relationship—to the book—and empathy. You can't have a discussion like this if students don't care deeply about the characters. In part this is a result of reading books instead of short text passages and excerpts. When you read a book, you build a relationship to its ideas

and characters. Some of the moments students reference in their enthusiastic and heartfelt discussion are scenes they read aloud together. Christine and her class brought them to life through shared oral reading—another thing we are told students don't like.

Those scenes are vivid and real to them in part because they experienced them together and in part because, as we discuss in Chapter Seven, stories themselves are psychologically or cognitively privileged. We have evolved to learn well from them and develop empathy for characters in them.

You will see this level of engagement and enthusiasm in many of the clips that we share with you in this book. Like Christine's, we think they will often inspire you and sometimes surprise you. And we think they will help us to describe practical ways to bring the research to life in classrooms that are both joyful and rigorous. We think this will result in students who are not just better readers but wiser, more engaged, and more motivated, both in classrooms and in their lives beyond it.

Notes

1. Not just our own, either. We have a team of curriculum developers who are all experienced teachers and who we think are brilliant, and we've worked with hundreds of teachers in schools in several countries developing and designing our materials.
2. https://carlhendrick.com/2017/05/06/five-things-i-wish-i-knew-when-i-started-teaching/comment-page-1/.
3. Quotation is from Carl Hendrick (https://carlhendrick.com/2017/05/06/five-things-i-wish-i-knew-when-i-started-teaching/comment-page-1/) glossing Frérédric Guay, Herbert Marsh, and Michel Bolvin's 2003 paper on the bidirectionality of academic self-concept and achievement, https://psycnet.apa.org/record/2003-01605-011.
4. Maryanne Wolf, *Reader Come Home: The Reading Brain in a Digital World* (Harper Collins, 2018), 23.
5. Courtney Stevens and Daphne Bavelier, "The Role of Selective Attention on Academic Foundations: A Cognitive Neuroscience Perspective," *Developmental Cognitive Neuroscience* 2 (2011): S30–S48.
6. https://files.eric.ed.gov/fulltext/EJ1134476.pdf.
7. Stevens and Bavelier, "The Role of Selective Attention on Academic Foundations."
8. This is a hotly debated topic among evolutionary biologists! Much of the answer probably depends on how you define speaking, but even if it were half the range we cite, the point—that we have had time to evolve our brains to speaking—would still hold. If

you're interested in the evolution of speech, Steven Mithen is a good place to start, and his appearance on the podcast *History Unplugged* on June 27, 2024 is engaging listening.

9. *Reader Come Home*, 18.
10. https://www.theguardian.com/commentisfree/2020/aug/24/deep-literacy-technology-child-development-reading-skills.
11. Ibid.
12. Héctor Ruiz Martín notes that the physical act of "reading is procedural knowledge, and as such, it is impossible to avoid doing it when we see words" (*How Do We Learn? A Scientific Approach to Learning and Teaching* [Jossey-Bass, 2024], 32).
13. J. Buck and J. Torgesen, *The Relationship Between Performance on a Measure of Oral Reading Fluency and Performance on the Florida Comprehensive Assessment Test* (FCRR Technical Report 1) (Florida Center for Reading Research, 2003).
14. https://eric.ed.gov/?id=ED587807.
15. R. Kuhn, P. J. Schwanenflugel, E. B. Meisinger, B. A. Levy, and T. V. Rasinski, eds., "Aligning Theory and Assessment of Reading Fluency: Automaticity, Prosody, and Definitions of Fluency," *Reading Research Quarterly* 45, no. 2 (2010): 230–51. https://doi.org/10.1598/RRQ.45.2.4.
16. David D. Paige, "Engaging Struggling Adolescent Readers Through Situational Interest: A Model Proposing the Relationships Among Extrinsic Motivation, Oral Reading Fluency, Comprehension, and Academic Achievement," *Reading Psychology* 32, no. 5 (2011): 395–425.
17. https://psycnet.apa.org/record/2018-39179-001.
18. https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=6744&context=etd.
19. Fifty-three percent was attributable to the different but less frequently assessed skill of silent reading fluency.
20. https://files.eric.ed.gov/fulltext/ED495465.pdf.
21. Elsewhere, Paige and colleagues write: "We argue that fluency be made an integral part of reading instruction for secondary students struggling in reading." See David D. Paige, Timothy V. Rasinski, and Theresa Magpuri-Lavell, "Is Fluent, Expressive Reading Important for High School Readers?" *Reading Psychology* 32, no. 5 (2011): 395–425.
22. https://eric.ed.gov/?id=EJ571299.
23. Interview with David Paige by the authors, December 11, 2023.
24. https://nces.ed.gov/pubs95/web/95762.asp.
25. We'd argue that all subjects are literacy-based! We also note here that English is more orthographically complex than Italian. This is to say it's less predictable and consistent

in spellings and sounds. It's harder to read fluently and so we might conjecture that the study's findings would be even more strongly manifested among subjects reading in English (L. Bigozzi, C. Tarchi, L. Vagnoli, E. Valente, and G. Pinto, "Reading Fluency as a Predictor of School Outcomes Across Grades 4–9," *Frontiers in Psychology* 8 [2017]: Article 200).

26. https://pubmed.ncbi.nlm.nih.gov/28261134/.

27. https://www.scirp.org/journal/paperinformation?paperid=60253.

28. Interview with the authors, December 11, 2023.

29. https://www.ascd.org/el/articles/beyond-comprehension.

30. Increasing instructional time to more than a bare minimum of a few minutes, this is to say. In other words, everything you need to know about what an inference is can be taught in less than a single lesson. Beyond that, you are wasting your time.

31. https://ascd.org/el/articles/beyond-comprehension.

32. https://fordhaminstitute.org/national/commentary/dylan-wiliams-guide-clear-education-thinking.

33. https://psycnet.apa.org/record/1988-24805-001. Also described here: https://www.coreknowledge.org/blog/baseball-experiment-two-wisconsin-researchers-discovered-comprehension-gap-knowledge-gap/.

34. Discussed on the *Melissa and Lori Love Literacy* podcast, episode 139, January 13, 2023, and partially transcribed on Doug's blog here: https://teachlikeachampion.org/blog/a-slightly-annotated-willingham-on-science-of-reading/.

35. https://www.tandfonline.com/doi/full/10.1080/02702711.2021.1888348.

36. https://education.ohio.gov/getattachment/Topics/Learning-in-Ohio/Literacy/Literacy-Academy/2023-Literacy-Academy/Language-Comprehension-Components-Necessary-for-Reading-Comprehension.pdf.aspx?lang=en-US. Walker refers to J. G. Cromley and R. Azevedo, "Testing and Refining the Direct and Inferential Mediation Model of Reading Comprehension," *Journal of Educational Psychology* 99, no. 2 (2007): 311–325. https://doi.org/10.1037/0022-0663.99.2.311; Y. Ozuru, K. Dempsey, and D. S. McNamara, "Prior Knowledge, Reading Skill, and Text Cohesion in the Comprehension of Science Texts," *Learning and Instruction* 19, no. 3 (2009): 228–242. https://doi.org/10.1016/j.learninstruc.2008.04.003; among other studies.

37. Daniel T. Willingham, *Why Don't Students Like School?: A Cognitive Scientist Answers Questions About How the Mind Works and What It Means for the Classroom*, 2nd ed. (Jossey-Bass, 2021), 28—29.

38. https://www.theguardian.com/commentisfree/2023/dec/10/scottish-schools-have-tumbled-from-top-of-the-class-this-is-what-went-wrong.

39. https://reformscotland.com/2023/12/pisa-2022-in-scotland-declining-attainment-and-growing-social-inequality-lindsay-paterson/.

40. Not a huge surprise given that it is a form of background knowledge.

41. https://www.tandfonline.com/doi/abs/10.1207/s1532799xssr1004_3 and https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4331220/.

42. https://www.researchgate.net/publication/216458681_Testing_and_refining_the_direct_and_inferential_model_of_reading_comprehension.

43. https://www.researchgate.net/publication/294687164_Reading_comprehension_A_conceptual_framework_from_word_meaning_to_text_meaning.

44. https://www.tandfonline.com/doi/abs/10.1207/s1532799xssr0102_4 and https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4331220/.

45. https://www.researchgate.net/publication/254316536_The_State_of_Vocabulary_Research.

46. https://www.tandfonline.com/doi/full/10.1080/19345740802539200.

47. I. L. Beck, M. G. McKeown, and L. Kucan, *Bringing Words to Life: Robust Vocabulary Instruction* (Guildford, 2013), 3.

48. A. E. Cunningham and K. E. Stanovich, "What Reading Does for the Mind?," *American Educator* 22 (1998): 8–15.

49. https://journals.sagepub.com/doi/full/10.1177/09637214221103264.

50. One very simple and often overlooked way to develop students' vocabulary is to read aloud to them from text that is more advanced (and therefore contains more advanced words and syntax) than what they could read simply on their own.

51. https://pubmed.ncbi.nlm.nih.gov/37541302/#:~:text=Results%3A%20Findings%20reveal%20second%20grade,words%20in%20the%20English%20language.

52. https://www.cairn.info/revue-l-annee-psychologique1-2014-4-page-623.htm.

53. Isabel L. Beck, Margaret G. McKeown, and Linda Kucan, *Bringing Words to Life: Robust Vocabulary Instruction* (Guilford Press, 2002).

54. *Bringing Words to Life*, 179. They reference M. E. Curtis and R. Glaser's 1983 study of depth of vocabulary knowledge (https://psycnet.apa.org/record/1984-05278-001) and M. M. Van Daalen-Kapteijns and M. Elshout-Mohr's 1981 study (https://psycnet.apa.org/record/1982-04924-001).

55. Maria Konnikov, *The Biggest Bluff: How I Learned to Pay Attention, Master Myself, and Win* (Penguin, 2020), 133.

56. T. Shanahan, "Nature of the Reading–Writing Relation: An Exploratory Multivariate Analysis," *Journal of Educational Psychology* 76, no. 3 (1984): 466–477. https://doi.org/10.1037/0022-0663.76.3.466.

57. Steve Graham and Michael Hebert, *Writing to Read: Evidence for How Writing Can Improve Reading. A Carnegie Corporation Time to Act Report* (Alliance for Excellent Education, 2010), 13.

58. Ibid., 14.

59. Ibid., 13.

60. The term *syntactic control* term is originally Bruce Saddler's. His 2012 book, *The Teacher's Guide to Effective Sentence Writing*, is excellent.

61. Ibid., 17.

62. Johann Hari, *Stolen Focus: Why You Can't Pay Attention* (Bloomsbury, 2023), 83.

63. Ibid.

64. Ibid., 84.

65. ACT, "Reading Between the Lines: What the ACT Reveals About College Readiness in Reading" (2006).

66. Ibid., 16–17.

67. https://www.readingrockets.org/blogs/shanahan-on-literacy/more-bad-ideas-about-why-we-should-avoid-complex-text-reading.

68. "Reading Between the Lines," 24.

69. https://www.tandfonline.com/doi/full/10.1080/02702711.2021.1888348.

70. Wiliam posted on the social media platform X (then Twitter), "I've come to the conclusion Sweller's Cognitive Load Theory is the single most important thing for teachers to know," on January 26, 2017.

71. *How Do We Learn?*, 26–27.

72. We are forever referring to working memory as a part of our brains, but this is a misnomer in many ways. Working memory does not have a specific location—it is a state of consciousness supported by disparate functions from around the brain. Probably for that reason, Héctor Ruiz Martín is careful to call it a *mental space*.

73. P. A. Kirschner, J. Sweller, and R. E. Clark, "Why Minimal Guidance During Instruction Does Not Work: An Analysis of the Failure of Constructivist, Discovery, Problem-Based, Experiential, and Inquiry-Based Teaching," *Educational Psychologist* 41, no. 2 (2006): 75–86, https://doi.org/10.1207/s15326985ep4102_1.

74. Sean Achor writes, "Scientists estimate that we remember only one out of every 100 pieces of information we receive" in *The Happiness Advantage: How a Positive Brain Fuels Success in Work and Life* (Crown, 2010), 94.

75. https://psycnet.apa.org/record/1974-08440-001.

76. https://augmentingcognition.com/assets/Bjork1994.pdf.

77. This phrase appears repeatedly throughout *Why Don't Students Like School?*

78. Important note: if we make it too hard learners tend to shut down; they need to think hard but generally successfully about a learning object.

79. *How Do We Learn?*, 41.

80. https://link.springer.com/article/10.3758/s13423-020-01762-3?utm_source=snacks.pepsmccrea.com&utm_medium=newsletter&utm_campaign=externalising-thinking&_bhlid=6a1631ab86343e9a12fa5b769670a8f5bed83a41.

81. https://psycnet.apa.org/doiLanding?doi=10.1037%2F0278-7393.15.4.669.

82. K. Sedova, and M. Sedlacek, "How Vocal and Silent Forms of Participation in Combination Relate to Student Achievement," *Instructional Science* (2023). https://psycnet.apa.org/record/2023-41662-001, https://psycnet.apa.org/record/2023-41662-001.

83. *How Do We Learn?*, 40.

84. A.-M. Singh, N. Marcus, and P. Ayres, "The Transient Information Effect: Investigating the Impact of Segmentation on Spoken and Written Text," *Applied Cognitive Psychology* 26 no. 6 (2012): 848–53.

85. *Why Don't Students Like School?*, 37.

86. See Graham Nutall, *The Hidden Lives of Learners*. "We discovered that a student needed to encounter, on at least three different occasions, the complete set of the information she or he needed to understand a concept" (2007, 63). For a good and through treatment of Retrieval Practice see Peter C. Brown, Henry L. Roediger, and Mark A. McDaniel, *Make It Stick: The Science of Successful Learning* (Belknap, 2014).

87. *How Do We Learn?*, 118.

88. Paul A. Kirschner and Carl Hendrick, *How Learning Happens: Seminal Works in Educational Psychology and What They Mean in Practice* (Routledge, 2020), 101.

89. *How Do We Learn?*, 128.