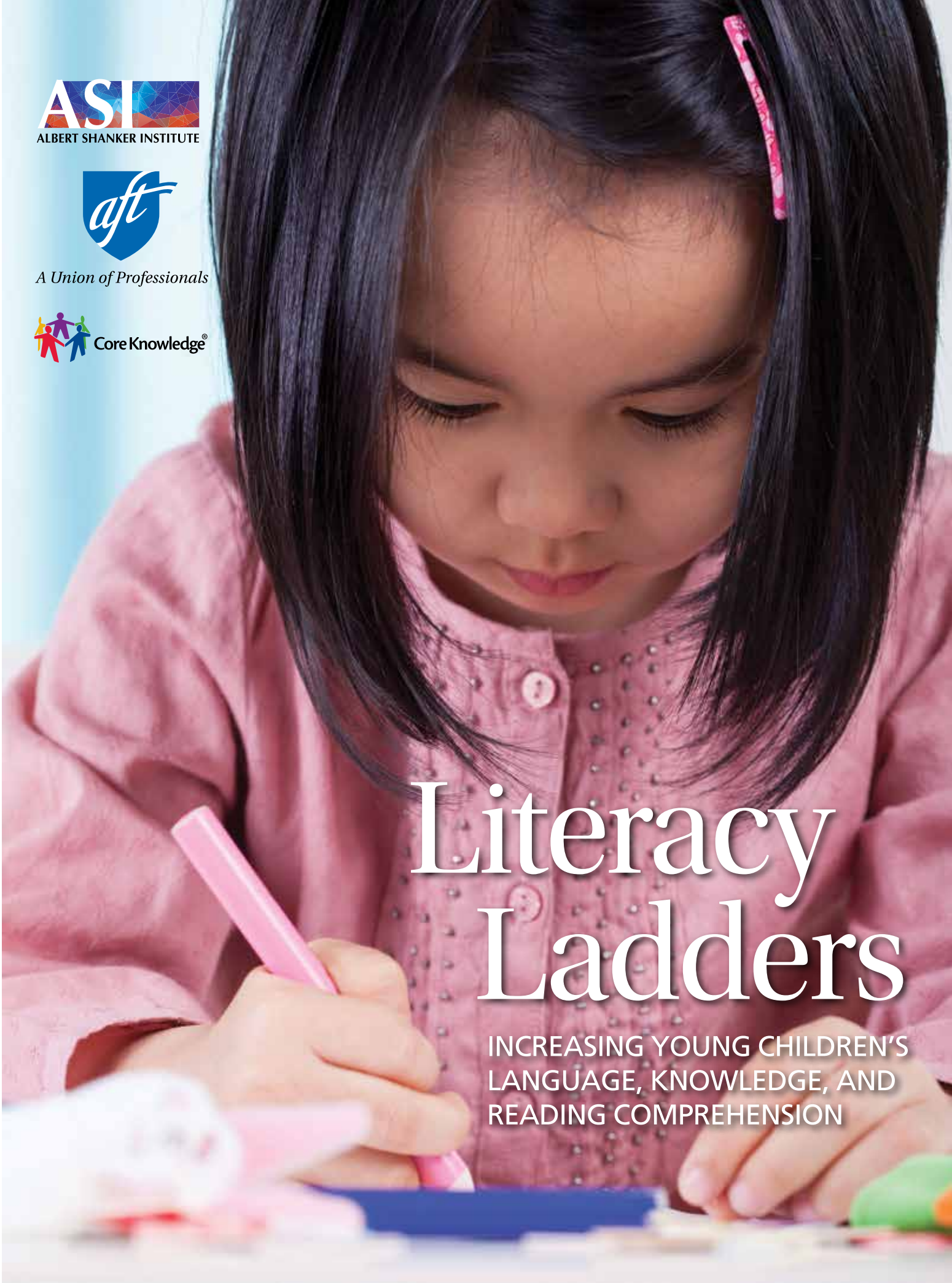

ALBERT SHANKER INSTITUTE

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Literacy Ladders

INCREASING YOUNG CHILDREN'S LANGUAGE, KNOWLEDGE, AND READING COMPREHENSION

This volume is a joint project of the Albert Shanker Institute (ASI), American Federation of Teachers (AFT), and Core Knowledge Foundation, each of which is dedicated to improving education and closing the achievement gap through high-quality early education. This volume is a curated collection of essays on some of the policies and practices required to create an excellent early childhood education system for all children and on the research supporting them. Except for the preface, which was written by the acclaimed reading researcher Marilyn Jager Adams expressly for this volume, all of the essays were previously published in *American Educator*, the AFT's quarterly magazine of educational research and ideas. Most of the artwork in the volume was cheerfully created by the children of the AFT's staff.

ALBERT SHANKER INSTITUTE

The Albert Shanker Institute is a nonprofit, nonpartisan organization established in 1997 by the American Federation of Teachers to honor the life and legacy of its late president Albert Shanker. The Institute's mission is to promote democracy by supporting two fundamental principles: the right of every child to quality public education and the right of every worker to a voice on the job.

A Union of Professionals

The American Federation of Teachers is a union of professionals that champions fairness; democracy; economic opportunity; and high-quality public education, healthcare and public services for our students, their families and our communities. We are committed to advancing these principles through community engagement, organizing, collective bargaining and political activism, and especially through the work our members do.

Core Knowledge®

The Core Knowledge Foundation is an independent, nonprofit, nonpartisan organization founded in 1986 by E. D. Hirsch, Jr., that advocates for content-specific, coherent, cumulative curriculum. The Foundation develops curricula, publishes educational books and materials, provides professional development for educators, and supports a growing network of Core Knowledge schools.

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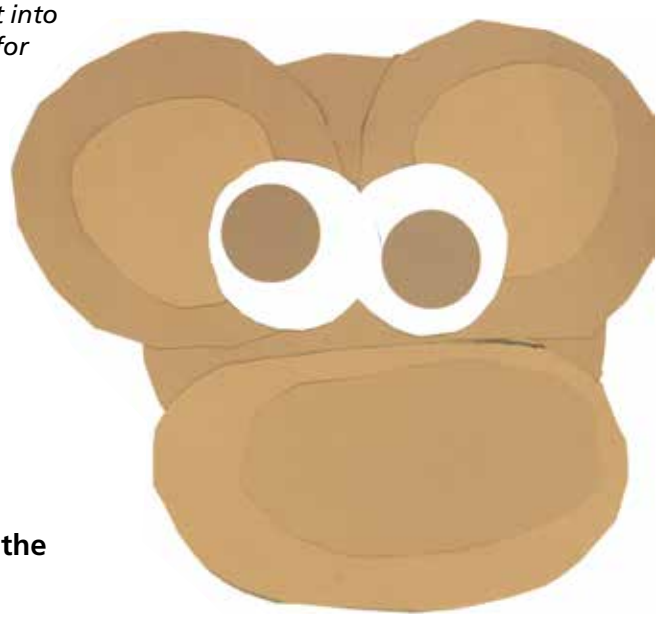

PREFACE
Knowledge for Literacy

By Marilyn Jager Adams

The very purpose and promise of schooling is to prepare students for responsible adult lives—to be civically minded and informed, to pursue higher education, and to find gainful work that allows them to grow and contribute to society. Tragically, a significant percentage of U.S. students leave high school unable to read well enough for college, career, or citizenship. Given technology's accelerating impact on the labor market alongside trends in globalization, this shortfall has dire consequences for our children's social, physical, and economic well-being. Ensuring that schooling fulfills its purpose and promise for all children is the urgent objective of the Common Core State Standards (CCSS) in English language arts and literacy.[1]

A primary component of this objective is that students be given ample support and practice in reading, interpreting, and writing about texts as complex as those that characterize life beyond high school. Indeed, the complexity of the texts that CCSS recommends for high school students is far higher—by some estimates, *five grade levels higher*[2]—than those generally used in high schools today. But here lies our great dilemma. All by itself, just increasing the sophistication of assigned texts is unlikely to do much good. The problem in the first place, after all, is that most students are unable to understand such rigorous texts, and people do not learn from texts that they cannot understand: They do not even learn new words, much less assimilate new information.

In other words, the promise of the CCSS depends unforgivingly on our ability, as educators, to raise our students' language and literacy to levels that enable them to understand and gain from such texts. And again, for the majority of students, a dramatic increase is required.

The essays in this anthology are focused on this challenge. If you are like me, you will need to read all of these pieces more than once to begin to "hear" them and see how they fit together to inform instruction. In the spirit of an advance organizer, here is an overview of major points to bear in mind as you read.

1. Comprehension Depends on Knowledge

The overarching theme of this collection is that if we wish to advance our students' literacy, we must devote ourselves to increasing the breadth and depth of their domain knowledge.

This may sound very unmodern. With the internet, it seems that one can get the answer to virtually any question in a fraction of a second. Why, then, should how much somebody knows matter at all? The answer is that one can only understand and learn from language (oral or written) if it builds on what one already knows. Thus, the internet can be a wonderful tool for extending our knowledge of a topic. For wholly new topics, however, how can one even know what question to ask? Moreover, the internet is notorious for leading less savvy readers astray.

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Through language, novel concepts can only be communicated in the form of novel combinations of familiar concepts. The meanings of new words can be verbally explained only in terms of known words. Sometimes a new word can be adequately explained by comparing and contrasting it with familiar concepts (e.g., a mayfly looks like a giant mosquito but it is harmless). Otherwise, we must define the word by decomposing it into familiar concepts and then piecing together the whole. Either way, the usefulness of the effort depends on the familiarity of the supporting concepts we offer. Working with young children, for example, the word *tigers* might be adequately defined as "large wild cats with orange and black stripes"; in contrast, a definition such as "large carnivorous felines of Asia" would surely be far less helpful.

Yet the role of prior knowledge in understanding language runs far deeper than these examples show. The core definition of a word is only a tiny fragment of the meaning that makes it useful in understanding language. Neuroimaging confirms that the full meaning of a familiar word extends broadly through the mind, including associations to every trace that your experience with that word or its concept has left in your memory. For instance, your full knowledge of the word "apple" extends to the traces in your memory of the many apples in your life and how they have looked, felt, tasted, smelled, or sounded (e.g., when you bit into, dropped, or sliced them); of where you were and what else and who else was there with each apple; of picking apples, peeling apples, and bobbing for apples; of cider, apple pie, caramel apples, and Waldorf salads; of apple trees, teachers' apples, and poison apples; of "rotten apples," "apple-cheeked," "apple a day," and the "Big Apple;" of Adam and Eve, William Tell, George Washington, Steve Jobs, the Beatles, and so on. The more strongly or frequently any such association has been tied to the apples in your life, the more strongly it dominates your overall concept of an apple. But all of your experiences, be they direct or linguistic, are there—all waiting to be used in making sense of "apple" the next time you see or hear it.

When you encounter the word "apple" in conversation or text, it will automatically activate its entire, extended complex of associations in your mind, and the same thing happens when you encounter each successive word in the sentence. As the associations tied to each ensuing word in the sentence become activated, there are subsets of knowledge from different words that overlap or fit together, effectively becoming superactivated. As these overlapping associations correspond to the ways in which the meanings of these words are related to one another, they are the candidates for the intended sense and nuance of each of the words in this context. Meanwhile, the syntax of the sentence selects from these overlaps and organizes their roles and relevance so as to create a "best-fit" reconstruction of the author's intended message in your mind.[3]

The overarching theme of this collection is that to advance our students' literacy, we must increase their domain knowledge.

Alternatively, consider what happens if—whether due to vocabulary or reading difficulties—you cannot recognize a word at all. What you lose is not just the meaning of that particular word, but also the work it was supposed to do in selecting the appropriate dimensions of the meanings of the other words around it. In between—to the extent that you recognize the word but have scant knowledge of its meaning and usage—your understanding is commensurately impoverished.

The bottom line, as Hirsch (p. 33) summarizes, is that "In order to become better at reading with understanding, you already have to be able to read with understanding." In other words, as Willingham (p. 42) points out, knowledge is far more than "grist for the mill." Rather, knowledge is the very medium of understanding. It is for this reason that "Effectively teaching reading requires schools to systematically teach the diverse enabling knowledge that reading with comprehension requires" (Hirsch, p. 57).

2. Start Early

Knowledge, writes Willingham, grows exponentially: The more you know, the easier it is to learn (p. 42). Thus, as Hirsch[4] points out, the earlier that children are enrolled in quality preschool programs, the greater the gains (p. 40). The more they know each year, the more they will learn by the next.

But what makes a preschool program good? As Neuman and Wright have noted,[5] one very important preschool predictor of literacy is alphabetic knowledge—including the abilities to recognize, sound, and write the letters (p. 11). In the wake of the Early Reading First Initiative,[6] most early childhood education programs include activities intended to develop alphabetic knowledge. Yet, evidence abounds that most such efforts contribute little at all to their students' alphabetic knowledge.[7] This is not good. We must do a better job developing children's alphabetic knowledge. Unfortunately, there are fifty-two letters (since children must learn the capitalized and lower case forms), which is a lot. Worse, the letters look a lot like each other, and their names rhyme with each other. Worse still, they must be learned very, very well. Perhaps understandably, some have voiced concern that teaching the letters is developmentally inappropriate for preschool and kindergarten children. Yet the fact remains that the developmental inappropriateness of first grade is brutal for children who do not yet know the alphabet on entry.

Take care to fit letter work and play into every day—have the children sing them, march to them, chant them, name them, match them, play games with them, and write them over and over. Keep it light, and keep it fun, but do make sure the children learn. Happily, rote memorization profits more from revisits than cramming. This means that, given daily attention, the letters can be well-supported in developmentally appropriate ways in the time surrounding activities that are cognitively more absorbing.

And what should be those cognitively absorbing activities? Most important are activities designed to build the language, knowledge, and modes of thought on which understanding written text depends. Of these three dimensions, it is language—or, specifically, vocabulary—that is most measurable. Consequently, efforts to build children's reading comprehension are often focused on vocabulary per se.

But again, words are not just words. What makes vocabulary valuable and important is the knowledge to which each word points and the understanding afforded by that knowledge. Developing a serviceably rich representation of a word—of the ways the word is used, and of the knowledge that the word represents, and with which that knowledge, in turn, is associated—necessarily requires many different encounters across many different (and understandable!) contexts. Unfortunately, as Neuman and Wright report, remembering to adequately repeat and revisit new vocabulary is nearly impossible in the busy multi-task environment of the classroom (p. 14). How might we do better?

Neuman has said it beautifully, "Return book reading to its original purpose: Learning about ideas and the words that convey them."[8] Moreover, organizing the readings into topical units—such as kings and queens, or bees, or deserts—can multiply the impact many times over. Topical readings, as Hirsch points out,[9] provide a natural and highly productive way of revisiting and extending new learning (p. 38). Across readings, as the books build interlaced networks of knowledge, the similarities, contrasts, and usages of the words gain clarity. In tandem, the stories gain plot and excitement, and the informational texts gain structure and provoke wonder. Further, as the knowledge network is enriched, the mind is ever better prepared to understand the language of each new sentence.

Beyond vocabulary, research shows that gains in "book language" are among the strongest measurable benefits of reading aloud to children.[10] The syntax of written language is very different from that of oral language—so much so that asking students to read a sentence with familiar words but unfamiliar syntactic structure is like asking them to solve a math problem without the operators: The syntax specifies how the words in the sentence are to be interrelated; without it, the sentence reduces to word salad.

But again, there is good news. When the same sentence is expressively read aloud to a child, the shifts in the reader's pitch and timing convey its structure and make it comprehensible. Further, unlike the ABCs or phonics, learning syntax is natural; it is our birdsong. Research shows that children come to grasp a new syntactic structure just by hearing and understanding it remarkably few times.[11] Using and extending a new syntactic structure on her or his own, however, makes it part of the student's own productive language repertoire. Thus, Neuman and Wright urge early childhood educators to pick topics that can be enriched across a number of different texts, both fiction and nonfiction, and to complement the read-alouds with lively discussion, play settings, and other activities designed to engage the children with the language and content of the books.

Again, the full meaning of any concept in your mind is made up of all of the experiences and knowledge with which that concept has ever been associated over your lifetime. Yet, if you think about it, the meanings of most words overlap with the meanings of many other words in one way or another. These overlaps are very efficiently exploited by the brain. In particular, the brain makes heavy use of categories.

For example, much of what you know about the meaning of any common noun, say, *robins, vultures*, or *canaries* is stored with their category, *birds*: each has wings and feathers, it lays eggs, and it belongs to the larger category of vertebrate animals, which actively eat and move, have hearts, and so on. What is stored directly with any particular concept (or individual) is only that knowledge that belongs especially to it: a robin is a medium-sized woodland bird that is mostly grey with an orange breast and that eats worms; a vulture is a hawk-like bird with brownish-black feathers except on its head and neck (which are naked) and that eats carrion; a canary is a small yellow bird that sings and is often kept in a cage; Freddie is my grandmother's canary.

Similarly, the brain builds categories of verbs based on their core or nuclear meaning. As an example, the meanings of *peek*, *glance, glare,* and *ogle* are all built around the core meaning of *look*; they differ from each other only in how, why, or at what you are looking. As other examples, *march*, *strut, amble*, and *tiptoe* are all variations of the core verb *walk*, while *grumble*, *whisper*, *whine*, and *exclaim* are all variations of the core verb *speak*.

The brain builds such categories automatically as a result of its own architecture and organizational dynamics; because they are natural, categorization games are fun and easy for children. Even so, giving children conscious, thoughtful awareness of the nature and structure of categories allows them to examine, edit, and use categories purposefully, in service of thinking and language learning. Further, because categorization games inherently require children to think carefully about both the similarities and differences between the items to be sorted, they are an exceptionally efficient and powerful means of building vocabulary. In effect, the result is a

separate knowledge network for each word or concept that is firmly anchored to and clearly differentiated from its cousins.

It is for these reasons that games that involve categorizing nouns and comparing, contrasting, and enacting verbs are recommended in the Foundation levels of the CCSS. As Neuman and Wright's study so thrillingly demonstrates, these sorts of games are more than worthwhile (p.15). In the study they describe, categorization games worked wonders in narrowing the gap between less-advantaged preschoolers (including both native speakers and English language learners) and a comparison group of upper-middle class preschoolers.

As for dual language learners, the review by Goldenberg, Hicks and colleagues[12] (p.18) reveals many different ways of complementing home- and English-language instruction. Building, discussing, categorizing, and exploring new concepts is valuable for every child, regardless of the language in which it is done; what matters are the ideas and knowledge that underlie language. Based on the lessons of cognitive science, writes Hirsch,[13] knowledge-centered units in the early grades should raise reading achievement for all students even as they should help to narrow the language and literacy gaps that exist at school entry (p. 30).

Indeed, it is primarily this goal, the closing of gaps, that drives the universal preschool movement. As is, the differences in children's language and literacy levels at school entry are huge and tend to persist and even to grow across the school years. (p. 49).[14] Moreover, as Thomas Sticht has pointed out,[15] children actually spend very little of their time at school; while quality preschool programs are insuperably important, gap closing necessarily depends on improving the educational support and encouragement children receive at home. Whether gauged by their impact on children or parents, and whether measured in terms of cognitive or noncognitive skills, the recurrent finding is that the most effective early childhood education programs are coordinated with early parenthood education.

3. Lots More Reading

If the productivity of students' reading is so integrally dependent on the relevant knowledge with which they meet the text, then the next obvious question is how best to help them become more knowledgeable. The answer, echoed across all of these essays, is that the kind of knowledge required for reading develops first and foremost through reading. Our students need to be engaged in lots more reading than has been the norm. This means more eyes-on, minds-on reading by them, and it also means more reading aloud to them.

Most effective early childhood education programs are coordinated with early parenthood education.

As so brilliantly assessed through a program of research by Cunningham and Stanovich,[16] the amount of reading that school children do is a strong predictor of their general knowledge, vocabulary, growth in reading comprehension, decoding and spelling facility, and the quantity and quality of their writing. And that's so even when subtracting entry-level reading skills and general intelligence out of the equation. Among college students, the amount of reading predicts academic knowledge, practical knowledge, vocabulary, spelling, and verbal fluency even after controlling for differences in their reading comprehension and nonverbal ability. Among senior citizens, the amount of reading protects general knowledge and vocabulary from the cognitive decline of aging. In short, regardless of age or entry ability, reading makes people smarter.

The good news is that a reasonably modest reading schedule would make a huge difference to our students' literacy growth. If, for example, middle-grade students read for just 30 minutes per day, that would be six times more than is currently their norm. The bad news, of course, is that asking children to read does not ensure that they will read or that they will do so productively. It is easy to fritter away 30 minutes a day. Besides which, just as too many students don't read well because they don't read much; many of those same students don't read much because they don't read well.

Each of us is nodding and sighing. We all know this is so. However, the point—the urgency—of the CCSS is that somehow we must figure out ways to make it not so.

There is good news: For students who can cold read even a below-grade-level text with decent accuracy (≥95%) and moderate fluency (≥100 words per minute), significant improvement in reading ease and efficiency tends to come with surprisingly little practice—provided that students attend to those aspects of the texts that pose difficulties along the way.[17]

For primary-grades students, the potential of well-managed partner reading for increasing time on text is broadly appreciated.[18] While such extra time-on-text should be equally valuable for older students, they would seem to need some additional dynamic—something that will induce them to read more attentively. One such possibility follows directly from what is known as Zipf's Law. As I explain[19] (p. 63), the essence of Zipf's Law is that every natural language sample is centered on a relatively small set of words that are repeated over and over; these are the words most closely related to the topic of what the language sample is about.

As an example, consider a history textbook. The book can be completed by year's end by assigning a chapter a week, and you can motivate students' reading by scheduling a quiz each Friday. But alas, the results of the Friday quiz inevitably show that this incentive is somehow not enough for many students. Indeed, many students seem not even to have digested the first few pages of the chapter. In fairness, this should probably not be surprising; after all, the first few pages of each chapter are typically the hardest because they introduce new terms and issues. But here equally is the opportunity: As quantified by Zipf's Law, these same terms, words, and issues will dominate the chapter as a whole. That is, if you can get the students to process the chal-

lenges that arise in the first few pages, then the rest of the chapter should be far easier to read and understand.

Suppose, then, that you devote Monday's class time to having the students partner-read the first few pages of the chapter with the primary task of identifying aspects of the text—be they difficult words, complex sentences, allusions to information that is not in the chapter, or whatever—that they feel might pose difficulty for at least some students. The members of each pair are to take turns reading aloud and taking notes on issues of concern while you wander from pair to pair, sampling and guiding their discussion and note-taking and, importantly, praising their perspicuity in identifying potential difficulties. Bringing the whole class back together, ask the students to share and grapple with the issues they have identified. To close the session, you can lead them to shape the major questions to be borne in mind while reading the rest of the chapter on their own—and they will now be in good stead to do so.

Of course, the chapters in a textbook generally offer little more than an introduction to a topic, rarely managing to convey well why a topic may be important or interesting to think about. Think of the glass as half full: A solid introduction opens the door for more thoughtful and substantive exploration of the topic. Textbook chapters are always best followed with more specific and thought-worthy texts (which can be coupled with variations on the same game, e.g., look for each side's arguments, inconsistencies, critical events, and the like).

Remember too that, as mentioned in many of the essays, children's listening comprehension surpasses their reading comprehension roughly until they are able to cold-read texts of middle-school reading levels with solid fluency. As a result, reading aloud and discussing materials that are beyond the students' current reading capacity serve to enrich their understanding of the topic at hand while preparing them to manage more complex language, information, and modes of thought on their own. The essay by Hall and Moats[20] provides a vivid tapestry of the kinds of learning that book reading affords, resulting in "a huge inventory of mental images of life's experiences … much more rapidly than the child could experience firsthand" (p. 23) and, more, one that is available forever.

Even one-on-one, however, reading a challenging text just once with a child is seldom enough. With a roomful of kids, even less gets through; sometimes, so little gets through that they do not even want a re-reading—ouch. Adults can discern speech in noisy environments by filling in the blanks from their own language and vocabulary. For students who do not yet own the language and words of the book, a wireless microphone can make all the difference. Similarly, panning books across the group so that all can see and respond was the best available option not so long ago; today, a projection system can make the book-sharing sessions far more engaging and efficient. These sorts of aids should not be thought of as nice-to-have luxuries. They are valuable for all students and arguably indispensable for younger children, those with low vocabularies, and English language learners. In addition, they can significantly increase the ease, efficiency, and power of your classroom instruction, discussion, and management.

4. Topical Units

Across these essays are descriptions of a number of studies designed to ask how topic-relevant background knowledge affects reading performance. Over and over, studies find better performance from people with ample versus slim background knowledge about the general topic of a text. The studies have found that people with more topic-relevant knowledge learn more, read more critically, make more and better inferences, are more alert to inconsistencies within the text, and are better able to see and apply the pertinence of what they've read to other situations. For comprehension, relevant knowledge is even more important that general reading ability. When the high- and low-knowledge groups are divided into good and poor readers, those with little knowledge relevant to the text at hand perform relatively poorly, regardless of how well they read in general. In contrast—and this is important—the performance of the poor readers with higher background knowledge is generally better than that of the good readers with less background knowledge, and nearly as good as the good readers with lots of background knowledge.

Prior knowledge about the topic at hand is like mental velcro. The relevant knowledge gives the words of the text places to stick and make sense, thereby supporting comprehension and propelling the reading process forward. Thus, in a study described by Willingham, scientists monitored readers' eye movements while reading about topics that were more versus less familiar to them (p.43). Given texts about the less familiar topics, people's reading slowed down and the progress of their eye movements was marked with more pausing and rereading. In other words, it is not just that readers with less topic-relevant background knowledge gain less from reading about that topic, it is also that less-knowledgeable readers must expend more time and more effort to arrive at what limited understanding they do gain.

What does information have to do with text complexity? They are closely related in two important ways (p. 60). On one hand, texts that are more complex in vocabulary and syntax tend also to be more presumptuous of readers' background knowledge.

On the other, texts that strive to present more precise argument or more specific information on a topic are unavoidably more complex in vocabulary and syntax. In order for students to become comfortable and competent with these sorts of texts, they must first develop a supportive understanding of the broader topic or situation in discussion. And that's where topical units come in.

First, what is a topical unit? In a topical reading unit, all texts are about some aspect of a single main concept. As the texts become more sophisticated, their focus may turn to particular aspects of that concept—for example, a unit on sharks might include texts on their peculiar anatomy (no bones), ram ventilation (the inability of some sharks to breathe unless they are swimming), sensory systems (their awesome ability locate prey), how their skin (basically made of teeth) contributes to their speed, and/or what is known about prehistoric sharks—but the core concept, sharks, remains the same. Be warned that some reading programs mistake what might better be called "thematic units" for topical units. As a quick rule of thumb, if it is a topical unit, then the word or words naming the same core concept—in this case "shark"—should appear frequently in every text. (Note: Superficial treatments and texts about different concepts labeled with the same word don't count.)

In beginning a topical unit, it is wise to choose a text that presents a short, simple overview and to engage students in using its core words and in discussing and wondering about its core concepts, making sure they are well anchored. Moving through the unit, as major topical words arise over and over across texts, students will come to recognize them at a glance. More importantly, as these words will arise with slightly different linguistic and conceptual surroundings on each encounter, students will effectively be building and refining a network of knowledge about the concepts that the words name that is ever more richly interconnected and, therefore, ever more richly receptive and supportive of comprehension and refinement.

The deeper domain knowledge that topical units help students acquire is of inestimable importance in itself, but topical units also bring a number of other benefits alongside. Direct benefits that Hirsch[21] discusses (p. 30) include increases in reading fluency, accelerated vocabulary growth, and improvements in the spelling, style, organization, and ideas in their writing. Because topical units offer a means of scaffolding texts both lexically and conceptually, they allow students to rapidly work their way up to engage productively with texts that would otherwise be beyond their reach. In turn, experience in understanding more sophisticated texts brings additional benefits. In particular (p. 63), the mind is structured such that both the syntax and the sorts of relations among concepts that are built through deep reading about one topic are available in reading many others to the degree that they are related and so, too, are the kinds of arguments that authors offer to support their points.[22]

The bottom line is that unless and until the basics are in place, higher-order learning is not possible.

In short, an expert oceanographer can be expected to penetrate an advanced text in oceanography with remarkable ease and incisiveness. However, people who have engaged deeply with complex information and argument in any scientific field—experts in biogenetics, mineralogy, physics, or marine biology, for example—could be expected to be able to understand the same text far better (even if with significantly more effort than the oceanographer) than the man on the street. The advantage of the oceanographer is due to the fact that, as Hirsch[23] points out, knowledge is domain specific. The advantage of the other well-read scientists is due to the fact that the modes of thought and analysis that deep knowledge affords are part of the literate mind.

5. Don't Neglect the Basics or Avoid Direct Instruction

There are some who are (mistakenly) celebrating the CCSS as an abandonment of basics and a return to whole language. Similarly, many have come to look askance at the value of direct instruction—too often cast as a the lingering dross of some old-fashioned notion of children's minds as empty jugs to be filled, drop by drop, with little pellets of knowledge meted out by the teacher. The bottom line, however, is that unless and until the basics are in place, higher-order learning is not possible. Consistently, even while emphasizing the importance of nurturing students' language and knowledge, every one of these essays firmly reminds us of the importance of securing the basics and of the value of direct instruction in so doing.

Within the literacy domain, basics are those core insights or principles that undergird systems of knowledge or conventions. Just as with any other kernel of knowledge, the basics become useful and usable only as they are linked within the student's mind to specific examples of their application.

Consistently, direct instruction consists of two parts, corresponding to two different meanings of the word "direct." The first is that the basic in focus is to be explained explicitly or directly. The second is that the usability of the lesson depends on directing the students' attention to concrete examples of the basic that is being taught. Indeed, the value of direct instruction is hastened by establishing (and, as necessary, reminding) an explicit contract with the students:

(1) My job is to explain how this basic works and walk you through some examples;

(2) Your job is to think—to apply and generalize the basic to new examples.

As Cunningham and Stanovich put it, "We must ensure that students' decoding and word recognition abilities are progressing solidly," for "it is difficult to overstate the importance of getting children off to an early successful start in reading."[24] Thus it is that the CCSS Foundational Skills for kindergarten and the lower elementary grades include a number of standards for word

recognition and spelling basics, phonemic awareness, phonics, and decoding. It is worth calling out, however, that the CCSS Foundational Skills also recommend that all children be able to recognize and write the letters of the alphabet by the end of kindergarten. With respect to literacy growth, letter knowledge is a basic among basics. Unless and until the students' can reliably discern one letter from another, teaching phonics, decoding, or spelling is a waste of time and even phonemic awareness remains out of reach. Nevertheless, recent data show that only a minority of children is able to name, sound, or write all the letters of the alphabet by the end of first grade.[25] This is a problem that we can and must fix.

Across the essays, you will also find recommendations for direct instruction in grammar, spelling, recognizing and understanding root words, and manipulating affixes. Goldenberg and colleagues[26] remind us that that students' home language can be invaluable in anchoring and clarifying lessons. Meanwhile, with focus on the strong association between the vocabulary gap and the fourth grade slump, Biemiller[27] (p. 48) argues passionately for more and better-planned attention to direct instruction in vocabulary, reminding us of both parts of the equation: (1) direct explanation of the words' meanings, and (2) ample experience with each new word in meaningful context, especially as gained through reading both by and to the children.

6. Curriculum

Finally, there is the question of "what knowledge?" The CCSS outline how well students should be able to read, write, and understand at each grade level, even to the point of specifying the sophistication or difficulty of the texts. The CCSS also recognize the importance of knowledge in this challenge, both through emphasizing informational texts and even the standards' full title: "The Common Core Standards for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects." However, the CCSS provide no guidance with respect to the domains of knowledge that warrant familiarity. Given the brouhaha about a "nationalized curriculum," perhaps this omission was politically wise. But is it educationally wise?

Hirsch[28] argues strongly that it is not. His work demonstrates that there is indeed a relatively stable, identifiable body of "core" knowledge—knowledge of certain people, places, events, and of certain social, natural, and physical principles, processes, and phenomena—that the average American is broadly expected to possess. Such "core" knowledge, he argues, is essential to literacy as it is presumed by—and therefore required for the understanding of—tests, textbooks, and all manner of responsible news and journalism.

Hirsch's work demonstrates that there is indeed an identifiable body of "core" knowledge that the average American is expected to possess.

If such knowledge is expected of every adult, then surely it ought to part of the education that our schools provide to every student. Moreover, Hirsch argues, it is just plain sensible to organize these topics in sequence, grade by grade. Such organization would ensure efficient coverage across classrooms and grades, and significantly mitigate the educational costs of between-school mobility. "If states would adopt a common core curriculum that builds knowledge grade by grade," concludes Hirsch,[29] "reading achievement would rise for all groups of children.... Equally important, the achievement gap between social groups would be greatly narrowed and social justice would be served" (p. 59). □

Endnotes

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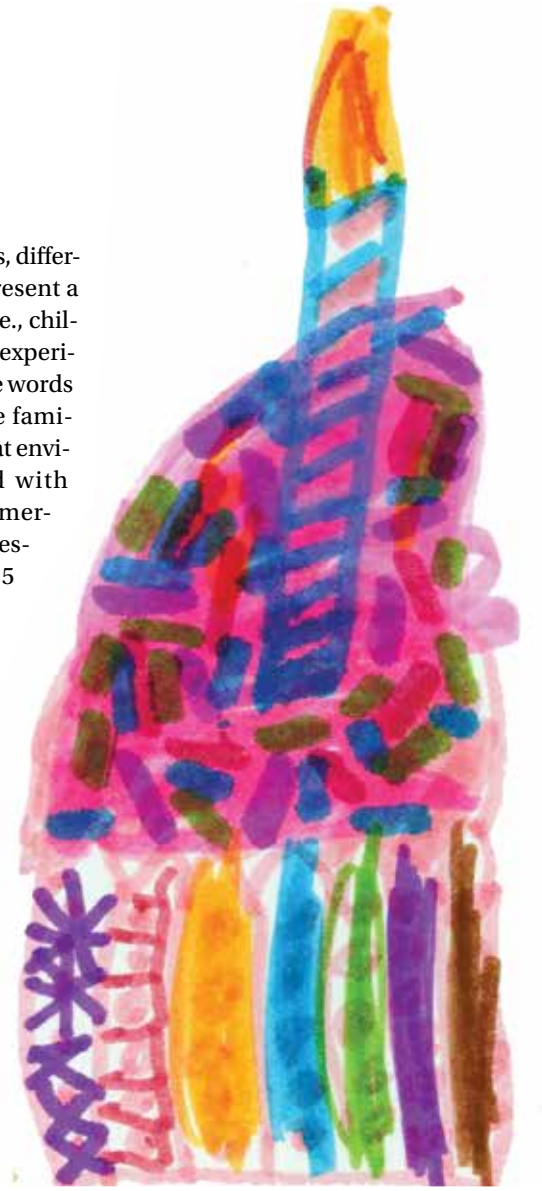
The Magic of Words

Teaching Vocabulary in the Early Childhood Classroom

By Susan B. Neuman and Tanya S. Wright

It seems almost intuitive that developing a large and rich vocabulary is central to learning to read. Logically, children must know the words that make up written texts in order to understand them, especially as the vocabulary demands of content-related materials increase in the upper grades. Numerous studies have documented that the size of a person's vocabulary is strongly related to how well that person understands what he or she reads, not only in the primary grades, but in high school as well.[1]

Yet here's the practical problem. Right from the beginning of schooling, there are profound differences in vocabulary knowledge among young learners from different socioeconomic groups. Just consider the following statistics: by age 4, a child's interaction with his or her family has already produced significant vocabulary differences across socioeconomic lines, differences so dramatic that they represent a 30 million word "catastrophe" (i.e., children from high-income families experience, on average, 30 million more words than children from low-income families). Recent analyses indicate that environmental factors associated with vocabulary development and emergent literacy skills are already present among children as early as 15 months of age.[2]



By first grade, unfortunately, the repercussions become all too clear: children from high-income families are likely to know about twice as many words as children from low-income families, putting these children at a significantly higher risk for school failure.[3]

Even more disturbing, however, is that these statistics are often treated as inevitable, more or less a byproduct of poverty or low-income status. Think of the consequences! This would mean that these children could be designated as reading failures before they ever enter through the schoolhouse doors.

Luckily, there is now a rich and accumulated new knowledge base that suggests a far different scenario. Consider these points:

- The highest rate of vocabulary development occurs during the preschool years; therefore, it represents a crucial time when we can intervene.[4]
- Effective vocabulary intervention can ameliorate reading difficulties later on. Children with resolved vocabulary delays can go on to achieve grade-level expectations in fourth grade and beyond.[5]
- The quantity, quality, and responsiveness of teacher and parent talk can effectively mediate socioeconomic status, thereby ensuring children's growth in receptive and expressive vocabulary.[6]
- Gains in oral vocabulary development can predict growth in comprehension and later reading performance.[7]

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This means that, in contrast to dire prognostications, there is much we can do to enable children to read and read well. Although we certainly have more to learn, the good news is that we now have an accumulated body of evidence on the characteristics of effective vocabulary instruction. And it turns out that this news couldn't come at a better time.

Oral Vocabulary Development and the Common Core State Standards

You might say that we are entering into a new age of educational reform: the age of the Common Core State Standards (CCSS). In the distant past, education was a local issue; districts acted on their own to adopt instructional guidelines and curriculum. In recent years, however, education has increasingly become more of a state and even a federal concern. The No Child Left Behind Act, the Bush administration's reauthorization of the Elementary and Secondary Education Act, increased the role of states in enacting standards, assessments, and accountability. In 2010, state governments took their turn, becoming more proactive in educational reform. The Council of Chief State School Officers and the National Governors Association, working with the organization Achieve, set out to develop world-class standards that would essentially create a shared vision of what all students should know and be able to do in all grades, kindergarten through high school.

The reason that this is relevant for those in early education on up is that 46 states and the District of Columbia have adopted these Common Core State Standards in English language arts and mathematics. The standards don't define how teachers should teach, but they do tell them what students need to know and be able to do. Further, starting in 2014–2015, state tests will be geared toward measuring whether or not students are achieving these standards. In essence, education is moving toward a more unitary system with a shared vision of expectations for student learning.

These CCSS represent a sea change in how we think about early literacy and reading, in particular, even before children enter kindergarten and throughout the early grades. Here, in a nutshell, are some of the design features:

- **A cumulative model of expectations:** It used to be called "spiraling," but the principle is the same. From grade to grade, similar standards will increase in complexity. For example, in kindergarten, children will be expected to "ask and answer questions about key details in a text, with prompting and support." Grade 1 has the same exact standard, although the children will now be required to do it on their own.
- **Informational texts:** Right from the start, the standards place greater emphasis on listening to and eventually reading informational books. In this respect, the standards focus on the integration of knowledge and ideas through text. Further, there is the expectation that children will be able to cross traditional genre boundaries and compare and contrast text features; for example, children might listen to an informational book about insects one day and a story about insects the next day, and then be asked about the connections between the two. Children will be expected to learn about key subject areas, particularly science and history, through texts. Certainly, this does not mean that we are going to abandon the children's literature or stories that we all have come to know and love. Rather, it simply means a greater balance between literary storybooks and informational texts.
- **Challenging materials:** There is greater emphasis on stretching students to meet the demands of reading harder text than before. In the past, we used to try to meet children's needs by selecting reading materials according to their instructional level; in some cases, when they have difficulty comprehending text, we'll even choose an easier text and have them gradually build up speed for more challenging materials. The CCSS use a very different model: children are required to read grade-level text. A teacher's job will be to help them learn through these more challenging texts without telling them what the texts say. For example, a teacher might focus on the organizational features of the text, the headings and subheadings, or the use of the glossary to unlock the meaning of words in context.

- **An integrated model of literacy:** Although the standards are divided into reading, writing, speaking and listening, and language, there is an expectation that all of these skills work together. Even kindergartners are expected to engage in rich conversations that place a greater emphasis on their abilities to build arguments from evidence in the text, whether it is read to them or they read it themselves.
- **An integrated media environment:** There is a greater recognition that today's "texts" don't come through only one medium—print. As all of us know, a high volume of information comes through print and nonprint media forms, both old and new. The CCSS encourage teachers to make use of multimedia, as it's embedded into every aspect of today's curriculum. Children will need to be able to gather,

comprehend, evaluate, and synthesize information and ideas through different forms of media.

In short, these standards focus on results rather than on means. They establish clear goals and expectations that are designed to help children succeed in a world in which the development of information capital is increasingly important. And whether they are ultimately successful in achieving these lofty goals depends on teachers and how well they are supported in implementing these new standards in the classroom.

So how do the CCSS relate to oral vocabulary development? And, for those who work with preschoolers or even younger children, how do K–12 standards affect what they teach? Here's why teachers need to be informed about these standards: it is impossible for children to read, and to understand what they read, without a strong foundation in oral vocabulary development. Without vocabulary knowledge, words are just words—without much meaning. If we are to help children take on seriously challenging texts, then we need to give them word and world knowledge to bring to these texts. Given that most oral vocabulary development grows from a massive immersion in the world of language, there is not a moment to waste.

The purpose of this article is to explain our rationale for content-rich oral vocabulary instruction in the age of the CCSS, and how to effectively build children's vocabulary. But first, we dispel some of the common myths about oral vocabulary development, which have often led to a lack of attention for this important topic in school instruction. We then move to a set of instructional principles that should guide teachers' work.

Common Myths

Like many myths, these notions may contain some partial truths, almost like folk wisdom. For example, some authorities once claimed that learning was based on the "neural ripening" of the brain; applied to reading, this reflected a philosophy of "wait and see" until the child appeared "ready" for instruction. Research and writings in the 1950s and 1960s by cognitive psychologists provided powerful evidence that early childhood was crucial in the cognitive development of an individual.[8] This conclusion led to designing new opportunities to engage children in early learning.

Similarly, a number of myths have been perpetuated about oral vocabulary development, and in many ways they have stymied efforts to promote quality teaching early on. Recent evidence has called into question these notions, and it suggests that we not only can improve children's vocabulary—we can *accelerate* it with instruction. These new findings have powerful implications for further reading development and content learning.

> By first grade, children from high-income families are likely to know about twice as many words as children from low-income families.

Myth 1: Children Are Word Sponges

Children seem to pick up words prodigiously and quite effortlessly. It looks natural. In one classic study, for example, researchers taught preschoolers a new color word simply by requesting, "You see those trays over there? Bring me the *chromium* tray. Not the red one, the *chromium* one."[9] When their memory for the new word was assessed one week later, the majority of children (63 percent) were able to correctly identify which color was chromium. Since this experiment, the term *fast mapping*—the notion that words can be learned based on a single exposure—has become common parlance to explain the extraordinary rate at which children seem to pick up words early on.

Today, however, there is ample evidence to suggest that children do not learn words through fast mapping.[10] Rather, they learn words by predicting relationships between objects and sounds, which become more accurate over time. Word learning is incremental.[11] Evidence for this comes from children's struggles to understand color words. Although infants can distinguish between basic color categories, it is not until about age 4 that they can accurately apply these individual color terms.[12] Typically, words such as *red* or *yellow* may appear in their vocabulary; however, their application of these words to their referents may be haphazard and interchangeable.

Children, then, may have knowledge of these words, but this knowledge will be far from complete. Rather, word learning in most cases requires many exposures over an extended period of time.[13] With each additional exposure, the word may become incrementally closer to being fully learned.

Myth 2: There Is a Vocabulary Explosion

It is often said that word learning starts rather slowly, then at about 16 months or when a child learns about 50 words, all of a sudden things begin to happen.[14] Word learning begins in earnest. Variously called the "vocabulary explosion" or "word spurt," it reflects the apparent dramatic ability of young children to acquire new words—on the scale of learning 10 or more new objects and names within a two- or three-week period. This notion of a vocabulary explosion may suggest that the optimal time for oral vocabulary development is in these toddler years.

Recent evidence, however, suggests that the "spurt" in word learning does not correspond to any change in the rate of word learning, but to a change in the rate of children's integrating new vocabulary.[15] In other words, it suggests that the vocabulary explosion is a byproduct of the variation in the time it takes to learn to actually use words. Although children are accumulating words at a constant rate, the written and verbal use of the words accelerates. We see, for example, a similar pattern with receptive and expressive language, with children demonstrating far greater capacity to understand meaning before they are able to effectively express ideas in words.

The course of word learning, therefore, has little to do with vocabulary explosions, bursts, or spurts. To the contrary, word learning is cumulative.[16] The high-performing student who knows many thousands of words has learned them not by having received a jolt of oral language early on, but by accruing bits of word knowledge for each of the thousands of words encountered every day. By the end of high school, one estimate is that college-ready students will need to acquire about 80,000 words.[17] This means that we should immerse students for extended periods in oral and written vocabulary experiences throughout their instructional years.

Myth 3: Storybook Reading Is Sufficient for Oral Vocabulary Development

Reading books aloud to children is a powerful and motivating source for vocabulary development.[18] We now have a large corpus of research showing that children learn words through listening to and interacting with storybooks. Nevertheless, recent studies have begun to question whether incidental instruction through book reading may be substantial enough to significantly boost children's oral vocabulary development.[19] Several meta-analyses, for example, have reported only small to moderate effects of book reading on vocabulary development.[20] One group of researchers examined the added benefits of dialogic reading, an interactive reading strategy, on children's vocabulary growth and reported only modest gains for 2- to 3-year-olds.[21] Further, these effects were reduced to negligible levels when children were 4 to 5 years old or when they were at risk for language and literacy impairments.

This means that exposure to words through storybooks is not likely to be potent enough to narrow the substantial gap for children who may be at risk for reading difficulties. Rather, to improve children's oral vocabulary development, teachers will need to augment the read-aloud experience with more intentional strategies that require children to process words at deeper levels of understanding.

Myth 4: We Do It All the Time

Most teachers try to consciously engage children in active experiences that involve lots of conversation throughout the day. In the course of a science activity, for example, a teacher may explain a word to help children understand the context. She might pause during the lesson and say, "That's the *predator*. That means he wants to eat the frog," providing a brief explanation that fits the context of the story. Or during a classroom discussion, a teacher might use the word *celebrate* when describing a birthday activity and then explain, "*Celebrate* means to do something fun." These events represent important teachable moments—informal opportunities to engage in word learning, somewhat parallel to the types of language exchanges between parents and their children.

However, over the course of the 20,000 hours parents and children spend together in the home *before* entering school, vocabulary words are likely to be repeated frequently. The problem is, teachers do not have that luxury. In our study of 55 kindergarten classrooms, for example, we found that although teachers provided more than eight of these word explanations per day, they were rarely, if ever, repeated more than once.[22] Further, words selected for teachable moments were different across classroom settings. Far too predictably, our study reported that children who attended schools in the most severely low-income neighborhoods were likely to hear far fewer explanations, with those explanations offered at lower difficulty levels, than children in middle- and upper-income areas.

With the implementation of the CCSS, children will be expected to understand content-related words in science and history. This means that we cannot rely on teachable moments alone to help children develop word meanings. Rather, we will need to be proactive in selecting words that have greater application to academic texts with increasingly complex concepts.

Myth 5: Just Follow the Vocabulary Scope and Sequence in a Core Reading Program

Several years ago, researchers examined the prevalence of oral vocabulary instruction in core reading programs at the pre-K level.[23] We found a dearth of instructional guidance for teachers, despite some "mentioning" of words. Since then, we have turned our attention to kindergarten and first-grade materials, focusing on the four most commonly used core curricula, to examine the breadth and depth of oral vocabulary instruction—the pedagogical features of instruction and how these features might align with research-based evidence on vocabulary development.

Despite greater attention to words in elementary curricula, our results indicated tremendous disparity across curricula.[24]

For example, one curriculum listed an average of 20 target vocabulary words per week to be taught, whereas another listed, on average, only two. Further, the criteria used to select words to teach remained a mystery. In one curriculum, words were selected based on the weekly stories. In other curricula, we could find no organizing principle for the selection of words at all. Finally, using three different criteria, we found that many of the vocabulary words

selected for instruction were far too easy to warrant school-based instruction.

This means that until such materials are developed, teachers are going to have to rely on a set of research-based principles to ensure that all students receive the quality of oral vocabulary instruction they need. In the age of the CCSS, students will need a specialized language—some describe it as academic language—to convey their ideas, which will facilitate the development of more complex concepts in multiple disciplines. And our efforts to enhance the ability of all children to communicate in academic language and academic thinking through oral vocabulary development must begin early.

Words represent the tip of the iceberg; underlying them is a set of emerging interconnections and concepts.

Principles of Effective Oral Vocabulary Instruction

Although there is certainly more to learn, we now have a growing research consensus about the characteristics of effective vocabulary instruction. Using evidence from our two recent meta-analyses synthesizing research from 75 vocabulary studies,[25] as well as our own studies examining some of the mechanisms for word learning,[26] five principles emerge to enhance oral vocabulary development, as described below.

Principle 1: Children Need Both Explicit and Implicit Instruction

Children benefit from explicit instruction. That is, children who are given child-friendly definitions of words or other attributes of the words to be learned are more likely to remember them. Prior to the beginning of a story, for example, a teacher might begin by introducing several words that are integral to the story. The teacher might encourage children to listen for each of the "magic words" during the story reading and to raise their hands whenever they hear one.[27] Then the teacher might say to students, "Oh, good. Some of you raised your hands! What word did you hear? Yes, the word *peculiar*. When Anansi said the word *seven*, a peculiar thing happened. *Peculiar* means strange or different."

Our syntheses of research reported that vocabulary gains were significantly higher when words were identified explicitly rather than implicitly (e.g., learning words by listening to a story). However, here's something to keep in mind: the largest gains were made when teachers provided *both* explicit and implicit instruction. One study, for example, found that engaging children in acting out words after explicitly defining them enhanced word learning as measured by standardized assessments later on.[28] In other words, when teachers made children aware of the meaning of the words and then engaged them in using those words in a meaningful context, children achieved greater gains than from explicit instruction alone.

Principle 2: Be Intentional in Word Selection

Given that there are only so many words we can teach—for example, one estimate is a total of about 400 words in a year—we must carefully select the words that we plan to teach. Some have argued that words for vocabulary instruction should be selected from high-utility sophisticated words (known as Tier 2 words) that are characteristic of written language.[29] For example, instead of using the words *keep going*, you can use a Tier 2 word such as *maintain*; instead of the word *lucky*, you might use the word *fortunate*. These words are domain general and are likely to relate to more refined labels for concepts that may enhance children's verbal functioning. Studies of "Text Talk," a strategy used to engage children in rich language instruction, have shown impressive results with kindergarten and first-grade children, demonstrating vocabulary gains about twice as large as those resulting from read-aloud studies.[30] Given this research-based evidence, the CCSS have adopted this heuristic for selecting words to teach.

However, our research suggests that it's also important to consider content-related words very early on. These are words that will be critical for developing knowledge in key subject areas. For example, vocabulary related to living things, such as *habitat*, *organism*, and *protection*, can help children talk about and learn about key science-related concepts; moreover, science vocabulary words such as *compare*, *contrast, observe,* and *predict* are fundamental inquiry words used not only in science but in all subject areas. In our research, we found that Head Start preschoolers are highly capable of learning and retaining these and similar words over time. Introducing students to content-related vocabulary, therefore, helps them to build word knowledge and concepts essential for developing knowledge systematically from texts.

Principle 3: Build Word Meaning through Knowledge Networks

It's fair to say that words represent the tip of the iceberg; underlying them is a set of emerging interconnections and concepts that these words represent. It is the rich network of concepts and facts accompanying these words that drives children's comprehension.[31] Thus, helping children to learn about words in clusters that represent knowledge networks has been shown to strongly support children's inferential reasoning and comprehension. For example, if you know the word *oar*, you probably also know something about rowboats and paddling. Teaching words in categories, such as "healthy foods" (e.g., *fruit, vegetable, protein*), also aids in the retention of these words.

Recent evidence for the support of teaching words in knowledge networks comes from two large-scale studies of vocabulary interventions for low-income preschoolers. One study, for example, used a number of useful strategies to help children share semantic similarities between words.[32] Strategies such as encouraging children to look at two picture cards with

words on them and make inferences about how these words work together helped them make comparisons of concepts. In our World of Words curriculum, we teach words related to a semantic category. For example, children learn words associated with "parts of the body," such as *abdomen, lungs, heart, and brain*, while focusing on the common features of the category (e.g., "parts of the body" means these are attached to the body).[33] We then engage children in playful activities called "time for a challenge" and ask them questions such as, "Are eyeglasses part of the body?" or "Is hair part of the body?" (Some children argue that hair is not part of the body because their daddies are bald!)

We found that clustering words within categories facilitated children's comprehension and provided promising evidence of accelerating word learning. For example, we showed a picture of a word not taught—in this case, *ankle*—and asked, "Is an ankle a part of the body?" Children who received instruction reported, "Yes, because it helps you walk," whereas a comparison child not receiving instruction just said, "Yes, 'cause." Similarly, children who received our vocabulary curriculum were able to apply their categorical information to new words, suggesting that they were using the semantic information about categories to make inferences and generalizations. Finally, helping children understand how words build knowledge networks facilitates our ability to make teaching them more meaningful. This represents a far cry from our analysis of vocabulary in core curricula in which a teacher might be guided to teach the words *platypus* and *around* on the same day.[34] Rather, children learn best when words are presented in integrated contexts that make sense to them. A set of words connected to a category such as "energy" can help children remember not only the words themselves but the linkages in meaning between them.

Principle 4: Children Need Repeated Exposure to Gain Vocabulary

Children are most likely to learn the words they hear the most. Findings from a large number of correlational studies on language have shown that frequency of exposure strongly predicts word learning and seems to have long-range consequences for later language and reading levels.[35]

Although this finding is often mentioned in the literature, what is new is that we may have underestimated the frequency required to learn words. For example, in attempting to better understand how many repetitions might be needed to learn a novel word, researchers studied 60 4-year-olds during a word-learning task.[36] First, the researchers identified a pseudo-word (e.g., *toma*) for the children, and then they engaged in playing a game involving the word, followed by a brief assessment. For each word, 12 children heard the new word repeated three times; another 12 children heard the word repeated six times; and so forth, for nine, 18, and 24 repetitions. Only 20 percent of the children who heard a new word three times remembered it; in fact, it wasn't until after *24 repetitions* that the majority of children (80 percent) successfully remembered the word.

The point, of course, is not that all words need 24 repetitions. However, this research does suggest that children need many more encounters with new words than we may have previously suspected. Strategies such as repeated reading have been shown to be effective in helping children acquire new words. In addition, children may benefit from rich explanations of newly encountered words. Rich explanations often include as much information as possible about the new word, including information conveyed through defining, providing synonyms, pointing to illustrations, and using the words in other contexts. These explanations can also give teachers further opportunities to repeat new words, thereby providing children with additional exposures. Another way to build repetition actually goes back to our previous point of teaching knowledge networks. Categories and semantic clusters provide a built-in mechanism for repeating words in meaningful contexts.

At the same time, it is also important for teachers to expose children to additional contexts in which the word might be used. Two researchers, in their work with second language learners, suggest that multimedia can be highly effective for enhancing the meanings of words.[37] Their research showed that multimedia-enhanced instruction significantly narrowed the gap between English language learners and non-ELL children in knowledge of targeted words. They found that video could help children learn by representing words in more than one media format, clarifying the instructional dialogue and adding more information to make sense of words that they are learning. Our research, as well, has shown that the addition of dynamic visuals and sounds in video accompanied by informational books provides children with multiple strategies for acquiring word knowledge. Together, this research highlights that frequency of exposure in a variety of meaningful contexts over an extended period of time enhances word learning. Further, children may continue to benefit from additional exposures to a word and its meaning even if they appear to already understand the word.

Recent evidence indicates that children need planned, sequenced, and systematic vocabulary instruction.

Principle 5: Ongoing Professional Development Is Essential

The results of our meta-analyses suggest that children's oral vocabulary development is highly malleable and can be significantly improved through intervention. However, these analyses also showed that teachers who have not received adequate preparation and teachers with limited educational backgrounds were not as effective in helping children make significant gains in vocabulary. Similar findings have been reported in other meta-analyses.[38] This research highlights the importance of ongoing professional development for teachers and other school staff who regularly work with children who might need

additional instruction.

Very recently, we have drawn from our work with young children the notion of an instructional regime as part of a teacher's ongoing work in the classroom. This pattern of instruction involves several key steps:

- Identifying words that need to be taught;
- Defining these words in a child-friendly way;
- Contextualizing words into varied and meaningful formats;
- Reviewing words to ensure sustainability over time; and
- Monitoring children's progress and reteaching if necessary.

This instructional regime, applied at any grade level, promotes greater attention to the depth of processing words and their meanings, and can provide a critical road map for the future planning of instruction.

Taken collectively, the five principles of oral vocabulary development, in effect, highlight an approach that is designed to help children unlock the complexities of texts that we see throughout the CCSS. Given that these standards place greater emphasis on students' abilities to build arguments from evidence in texts, these instructional principles will give them the tools to engage in academically enriching conversations that can be fulfilling and highly rewarding.

Common myths are often based on some partial truths that have since been debunked or at least shown to have serious flaws in their logic. This is the case with oral vocabulary development. In the past, we have often described young children as "word wizards," "word sponges," "lexical vacuum cleaners"—all denoting the supposedly easy process of vocabulary development. Too often, it has been assumed that word learning is natural and that the conditions in classrooms provide spontaneous opportunities for vocabulary development.

Teachable moments are important; however, they will not be sufficient for students to engage in complex texts. Rather, we will have to be much more strategic about word learning than our previous standards or instructional guidelines have acknowledged. Recent evidence indicates that children need planned, sequenced, and systematic vocabulary instruction. This means selecting words, concepts, and ideas that matter most to children right from the very beginning of schooling.

Many children from high-poverty circumstances will have had fewer experiences with the academic language that the standards require. Children who enter school in these situations will need skillfully developed instruction that not only improves their word knowledge and concepts, but actually accelerates their vocabulary development, maximizing the limited time they have in school. □

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Dual Language Learners

Effective Instruction in Early Childhood

By Claude Goldenberg, Judy Hicks, and Ira Lit

As the number of English learners in K–12 public schools has increased, so too has the population of preschool dual language learners, or DLLs. For preschoolers, the term dual language learners is preferred since young children are still in the midst of acquiring their first language.* More than 4 million DLLs are enrolled in early childhood programs nationally. Thirty percent of the children in Head Start and Early Head Start are DLLs.[1]

Although a large majority of preschool-age children in the United States attend some type of early education setting, Latino children and children of immigrants attend at a lower rate than do children of nonimmigrant parents.[2] This is unfortunate, since children who attend preschool during the year before kindergarten have an advantage in reading and math over their peers who are not enrolled in center-based care.[3] Many children who are learning English as a second language while they are gaining early proficiency in their home language are therefore disproportionately missing academic benefits that attending preschool provides.[4]

For those DLLs who do attend an early childhood care or education setting, early educators must be informed by what research has to say about creating optimal learning environments. Concern over the achievement of this population of students has led to a large number of recent research reviews and professional publications aimed at improving preschool DLLs' educational opportunities.[5] In this article, we survey this growing body of research to help inform educators responsible for creating settings for our young DLLs.

We organize our review of the research by addressing four key topics:

1. Employing children's home language in the early childhood curriculum;

2. Comparing effective practices for DLLs

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*For discussions of terms, see the CECER-DLL's website and the NCELA's glossary of terms.

and English speakers in English-only programs;

3. Promoting language development in English and the home language; and

4. Involving families in supporting children's language learning.

1. Employing children's home language in the early childhood curriculum

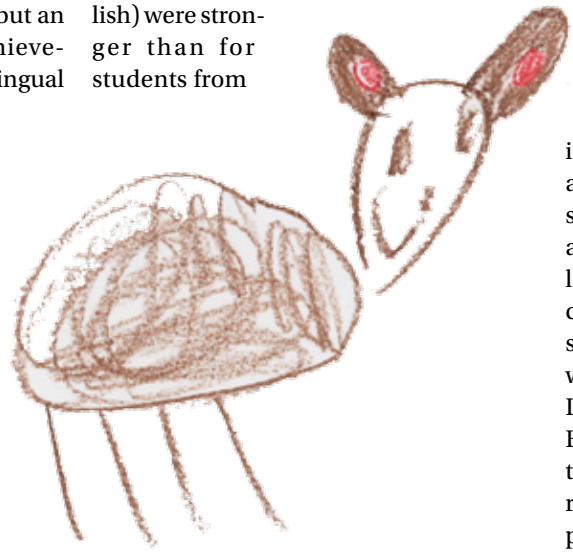
The debate over bilingual education has been the most controversial aspect of the education of English learners for more than a half century and continues to be politically charged.[6] Bilingual education's basic premise is that students should be taught academic skills in their home language as they learn and acquire skills in English. According to this view, instruction in the home language strengthens the home language and creates a more solid foundation for cognitive and academic growth in English; moreover, promoting bilingual competence is valuable in its own right. Opponents of bilingual education argue that instruction in students' home language both delays English learners' entrance into the academic and social mainstream and depresses English achievement; bilingualism might be fine, but the school should focus on rapid and effective English learning. Others have also raised concerns about the resources required to fund bilingual programs and whether the benefits justify the costs.[7]

Preschool studies tend to find that at best, instruction in the home language contributes to growth in both English and home language skills; at worst, there is no difference in English achievement but an advantage in home language achievement.[8] In addition to promoting bilingual language and literacy skills, utilization of the home language can also have psychological and social benefits that immersion in a second language cannot offer. One study[9] found that Spanish-speaking children who experienced Spanish interactions with their teachers were more likely to engage in more complex linguistic interactions than children who experienced only English interactions with their teachers. Teachers in classrooms where Spanish was used also tended to rate their students more positively in terms of the students' frustration tolerance, assertiveness, and peer social skills.

Teachers can also use the students' home language in various ways that support children's learning, even when instruction is essentially in English. For example, teachers could supplement a book they are reading aloud with explanations or brief clarifications in the home language or by pointing out a cognate (e.g., "Do you know what a market is? It sounds like mercado, right?"), which can make texts in English more accessible to DLLs and possibly make them aware of linkages across languages.

2. Comparing effective practices for DLLs and English speakers in English-only programs

Studies of effective early childhood curricula have shown cognitive and social benefits for DLLs that may be comparable to or greater than those for native English speakers. Researchers in Nebraska, for example, found that a professional development literacy workshop series (HeadsUp! Reading) for early childhood educators was equally effective in promoting early literacy skills for children from English-speaking and Spanish-speaking homes.[10] In Oklahoma, one of the pioneers of universal high-quality pre-K education, preschools produce developmental gains across various demographic groups, including Latinos, approximately 70 percent of whom come from predominantly Spanish-speaking homes. Gains for these students (in English) were stronger than for students from English-speaking homes;[11] this might be explained by the fact that the Spanish-speaking students began with far lower English levels than the English-speaking students.



Studies also illustrate the value for young DLLs of well-known elements of effective teaching, such as explaining vocabulary words encountered during reading and using them in different contexts.[12] In other words, successful teaching and curricula seem to be successful for most children, suggesting that there is probably considerable overlap between what is effective practice for DLLs and for students already proficient in English.[13]

Pictures help DLL preschoolers with low levels of oral English learn story vocabulary.

Regardless of their level of English development, young DLLs who are working to master the rudiments of English probably need additional supports to help them participate fully in classroom learning activities if the activities are in English. Although preschool DLLs benefit from explanations about the meaning of words (just as English speakers do), one study found that children who began with lower English scores learned fewer words than children with higher English scores.[14] Pictures help DLL preschoolers with low levels of oral English learn story vocabulary (e.g., dentist, mouse, cap), suggesting that visual representations, not just explanations, provide these children with additional

support for learning.[15] Video resources also have proven useful.[16]

Attempts to incorporate additional supports such as these into comprehensive programs and curricula have had mixed success. For example, a professional development program that succeeded in having early childhood educators add scaffolding strategies for DLLs into their core practices found that the improvements in child outcomes were limited to some phonological awareness measures.[17]

What we know about effective instruction in general is thefoundation of effective instruction for English learners of all ages.

The key message is that what we know about effective instruction in general is the foundation of effective instruction for English learners of all ages. "Generic" effective instruction, however, is probably not sufficient to promote accelerated learning among ELs, although it is almost certainly a necessary base. While we have some intriguing clues about what else is needed to make programs effective for English learners (as described in the related articles in the Summer 2013 issue of *American Educator*, "Unlocking the Research on English Learners" and "English Language Development"), there is little certainty about how to incorporate these supports into programs that optimize developmental outcomes for DLLs.

3. Promoting language development in English and the home language

Language development is, of course, a high priority in early childhood programs. English language development is critically important, but so is promoting development of the home language. Developing the home language is important in its own right and as a means of promoting other important cognitive and social outcomes.[18]

In her volume, *One Child, Two Languages*, dual language researcher Patton Tabors describes the sequence that most young children follow as they begin learning a second language in preschool.[19] First, young children often attempt to use their home language. Then, when they realize their home language is not working in this context, they tend to become silent. DLLs listen and observe, gaining an understanding of the classroom language. Next, they begin to "go public," testing out some new words and phrases. Finally, they begin to produce the new language, using phrases and then sentences.

Children may approach English learning differently, so this developmental sequence is not universal and invariant. But when teachers are aware of the general sequence, they have the opportunity to support DLLs most effectively. For example, it is important to be able to recognize and respond to children's nonverbal requests and protests—a silent child has needs that must be met, and the teacher can couple meeting those needs with introducing new phrases. Additionally, children who are not yet communicating verbally can be encouraged to build relationships through shared interests (e.g., working with a partner on a puzzle or dressing dolls) and through humor. Children can also be provided with the space and time both to act as spectators and to rehearse what they hear and want to repeat. Furthermore, models of pragmatically appropriate phrases—that is, appropriate to the particular situation in which the word or phrase is used—can be very useful for children who are just starting to "go public" with their new language.

As discussed in the article "English Language Development" (in the Summer 2013 issue of *American Educator*), explicit English language development instruction is also important. We know surprisingly little, however, about the relative effects, benefits, and disadvantages of different approaches to promoting English language development for DLLs in early childhood settings (or K–12 schools).

In early elementary settings, researchers [20] have found that a separate block of English language development instruction during the school day was somewhat more effective than only integrating English language development into other instruction throughout the day, although there certainly should be English language learning opportunities throughout the day as well. There is also evidence in the preschool context for a separate block of language development in the home language: for Spanish-speaking children in an English-immersion preschool, researchers found that a 30-minute block of Spanish-language development led to significant gains in children's oral proficiency in Spanish.[21]

Second-language instruction should provide an appropriate balance of opportunities for meaningful, authentic communication and for more organized instruction and specific feedback on the proper use of conventional forms.[22]

4. Involving families in supporting children's language learning

Families play an important role in helping to make children's preschool experiences

successful. DLLs' parents consistently show interest in their children's education and are highly motivated to provide their support.[23] Unfortunately, teachers often underestimate language-minority parents' ability to help their children succeed in school.[24] Most parents are responsive to focused and sensitive efforts to help them play an active role in supporting their children's earliest school success. However, researchers have found variability on the impact of home intervention programs on children's academic learning, perhaps due to the range of design and implementation features of various programs.

An important issue that parents and teachers ask about is whether parents of DLLs should use the home language with children exclusively or try to encourage more English use. Research and experience have established that children can learn more than one language, either simultaneously or sequentially, with no adverse effects.[25] In fact, in addition to the social and cultural benefits, there are potential cognitive advantages to growing up bilingual.[26] Yet many parents—and teachers—assume it is common sense that speaking more English at home will promote higher levels of English proficiency for children. Correlational studies do tend to corroborate these intuitions; use of any language at home is positively associated with children's learning outcomes in that language and negatively associated with outcomes in the other language. But findings are mixed: one study [27] found that increased use of English by Spanish-speaking mothers did not accelerate English growth by children—but it did decelerate Spanish vocabulary growth.

Bilingual language development need not be a zero-sum game, and parents should be reassured that use of the home language will not undermine children's English language development. Continuing to speak the native language can also be important for other reasons in addition to the cognitive and linguistic benefits, such as maintaining cultural and family values and communication. In sum, although more research is needed in this area, current research suggests that preschool educators should use children's native language where possible, apply specific strategies for building English language skills, and build bridges with families to support children's learning. ☐

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Why Reading to Children Is Important

By Susan L. Hall and Louisa C. Moats

"The single most important activity for building the knowledge required for eventual success in reading is reading aloud to children. This is especially so during the preschool years."[1]

–From *Becoming a Nation of Readers*

This conclusion, from an influential report entitled, *Becoming a Nation of Readers: The Report of the Commission on Reading*, resulted from a study sponsored by the National Institute of Education. The purpose of this review was to summarize the findings from research about reading and to make recommendations for instruction. This report, which was published in 1984, is still recognized as a landmark summary of research in reading and is frequently quoted in educators' books.

The fact that the Commission on Reading proclaimed the importance of reading to children may not surprise many parents; most parents have been told in many ways to read to their children. As a first-time parent, however, I became aware that although I had been repeatedly advised to read to my child, no one had ever explained why it was important.*

When my first child was born, I was working fulltime and feeling very overextended. I read many popular parenting books and worried about what my child ate, how to childproof the house, how to evaluate child-care options, and so forth. After a few months of feeling overwhelmed with how much there was to learn and do

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*Whenever you see a personal segment that uses "I," it is a story told by Susan Hall. We wrote these stories in her personal voice because we knew that other parents would readily identify with her puzzlement and her worry when her own son developed reading difficulties.

as a new parent, I decided to choose a couple of things that were important to me and do those really well. I chose two areas to concentrate on in my parenting, knowing I could not be an expert on every aspect of child rearing. Driven by interest, I made a commitment to do a particularly diligent job with building self-esteem and getting my child ready to read. My goal was to raise a child who loved to read and who had strong self-esteem. Little did I know at the time how connected these two goals are.

My choice of parenting goals may be of interest because one is a gift my parents gave to me and the other is a gift I discovered myself. My parents were amazingly intuitive about how to parent in order to raise a child with strong self-esteem. However, my parents didn't read to me as a child, and our home contained very few books. If they had been advised that reading aloud was critical for success in school, I have no doubt that my parents would have read to me and my siblings in spite of the fact that neither parent read for pleasure. In the 1950s, the importance of reading aloud to children wasn't widely known or communicated to parents. Because reading was not emphasized or modeled at home, I did not discover reading for pleasure until my late teen years. I missed the pleasure of many classic children's stories in my own childhood; therefore, the prospect of sharing them with my own children was doubly inviting. I'd get what I'd missed; they'd get acquainted with the wonderful world of books.

Six Reasons Why Reading Aloud Helps

Having decided that I wanted my children to be readers, I began paying close attention to anything written about how children learn to read. In my journey through all the parenting books, I was on the lookout for anything about reading. The recommendation that parents should read to their children came through loud and clear, so I began to purchase children's books and read aloud to my children. However, being an overly analytical person, I began to wonder about why I should read to my child and what proof there is that it really makes a difference. Although regularly reading aloud to our children was a habit my husband and I embraced, I was nagged with these questions and struck by the fact that I had never seen an explanation of how this activity benefits children's subsequent reading ability.

It was during my first course in a master's program in education called "Survey of Reading Methods and Materials" that the answers emerged. One summer as I sat on my deck reading the textbook for this course, it all began to make sense. The information about what reading aloud to a child accomplishes was there in the textbooks for educators. But why wasn't this information in parenting books? That was probably the moment of conception for this book.

Benefit: Builds Background Knowledge

Probably the most critical benefit of all those hours of reading stories to our children is that the child gains knowledge of things, people, and places that he is less likely to acquire from any other source. Every story a parent reads to a child gives information about an environment and images of things that happen in that environment. It is almost as if we are creating a huge inventory of mental images of life's experiences and doing so much more rapidly than the child could experience firsthand, even in families that emphasize travel and conversation. Later, when the child reads a sentence or passage about a topic he is at least somewhat familiar with, it is so much easier for him to determine unknown words and comprehend what he is reading. Having background, or prior knowledge, about the topic when reading a new book is a critical component of later

How Does Reading Stories Aloud Benefit My Child?

There are some well-researched benefits to a child whose parents read aloud to him.

Benefits from Reading Aloud

The child

- develops background knowledge about a variety of topics.
- builds his vocabulary.
- becomes familiar with rich language patterns.
- develops familiarity with story structure.
- acquires familiarity with the reading process.
- identifies reading as a pleasurable activity.

Each of these benefits is explored in this article, along with evidence that reading aloud to our children will encourage them to be readers.

comprehension after the child has learned to read the words.

After reading about background knowledge in my education textbook, I began examining children's stories to see what kind of information is contained in them. Let's take a popular children's story and assess it from the perspective of what it provides the child. My oldest child loved Curious George stories written by H. A. Rey. Because I have fond memories of how much we enjoyed reading these stories, I've chosen one for an analysis of the background information provided in it.

Overview of the Story—Curious George Gets a Medal

In this classic children's book, a monkey named George is the center of the story. He is very curious and causes some difficulty each time he pursues his curiosity by exploring something. In this 47-page illustrated book, George, who is home alone, receives a letter. While trying to write a response, he spills ink which he is trying to pour from a bottle into a fountain pen. The mess becomes much worse as he tries to clean up the ink with soap flakes and water from a garden hose. Having partially filled a room with lather and water, he runs to a nearby farm where he remembers seeing a portable pump.

The events at the farm continue with difficulties. Because the pump is too heavy for him, he decides that he can get a farm animal to pull the pump back to his house. However, his first effort to get a pig to pull the pump results in all the pigs rushing out of the fence once he lifts the latch. He finally realizes that a cow is a better choice and begins the journey home on the cow's back with the pump pulled behind them. However, the farmers see them and a chase begins. George hides in some laundry on a clothesline and then jumps in the back of a passing pickup truck.

The truck happens to be on its way to the Museum of Science to deliver a large box. George, who does not know what a museum is, goes inside to satisfy his curiosity. He explores the rooms with stuffed prehistoric animals and eventually spots some nuts on a tree in the dinosaur exhibit. Since he is hungry he climbs onto the dinosaur's head and accidentally pulls the artificial tree over, knocking down the dinosaur. The guards catch him and lock him in a cage. His friend, "the man with the yellow hat" (who had brought him from Africa in the first book) arrives just in time to save him from being taken to the zoo.

George's friend is carrying the letter that had been delivered by the mailman at the beginning of the story. The letter was written by "Professor Wiseman," the director of the museum, to invite George to ride in a spaceship which has been built as an experiment. In order to be forgiven for the mess he made at the dinosaur exhibit, George agrees. George blasts off in a tiny spaceship and must bail out by pulling a lever when a light is illuminated inside the ship by remote control from Earth. He parachutes out just in the nick of time and receives a medal for being the First Space Monkey.

> Probably the most critical benefit of reading stories to our children is that the child gains knowledge of things, people, and places.

Background Information from the Story

There is an amazing amount of background information in this story. Our lovable, curious monkey demonstrates practical things, such as how fountain pens are filled with ink and what happens when soap flakes are sprayed with water from a garden hose. While George goes to the farm, he observes the pigs squealing and grunting and running away as fast as they can. He also contrasts the pigs' behavior to that of the cows, who were gentle and strong and far better candidates to pull the pump for him. All these observations provide background information for the child about the behavior of different farm animals.

George, who had never been to a museum before, makes observations about this unfamiliar environment. George observes that the large animals he sees do not move. The author writes:

> They were not alive. They were stuffed animals, put into the Museum so that everybody could get a look at them.[2]

The book provides illustrations of the several rooms of stuffed animals, including the dinosaur exhibits. For a very young child, this may be his first exposure to a museum of this sort.

As the story continues through the spaceship scenes, there is some additional background provided. George is dressed in a space suit with a helmet, air tank, gloves, and shoes. A satellite dish and monitor screen are shown in the illustrations to explain how the people on earth communicate with the monkey in the spaceship. The blastoff scene is complete with a countdown before the rocket engine is ignited and the ship blasts off. The description of the ship continues:

> He pressed the button and the ship rose into the air, slowly first, and then faster and faster and higher and higher, until they could no longer see it in the sky. But on the screen they saw George clearly all the time.[3]

A young child hearing this story retains an impression of the blasting off of a spaceship and continued communications with Earth.

This classic children's story was written in 1957 and offers the opportunity for a parent to explain that there were no manned space flights then, yet we have achieved enormous progress in space flight during the last 40 years. Other scenes that date the book include the use of a fountain pen with a blotter and the laundry hanging on the outdoor clothesline. These nuances provide an experience from which to launch a discussion about the differences in technology and life in the 1950s versus today.

Benefit: Builds Vocabulary

A child with a large listening and speaking vocabulary has an enormous advantage in

Sample Vocabulary Words in Curious George Gets a Medal		
Scenes at the House	**Scenes at the Farm**	**Scenes at the Spaceship**
curious	shed	professor
fountain pen	loop	flash
funnel	grunting	signal
blotter	hurled	bail out
garden hose	latch grunting	emergency rockets
tap	squealing	permit
lather	grazing	space suit
escape	rattling	launching
portable pump	lever	site groping
		parachute

learning to read. Reading comprehension depends more than any other single skill on knowing the meanings of the individual words in the passage. When a child is trying to read an unfamiliar word after he has learned some phonics and word attack skills, he should begin to sound out the word. The process of relating the print to a spoken word is faster and more accurate when that word is already in the child's speaking vocabulary. For example, if a child encounters the word *museum* for the first time in print, he is likely to say the word correctly if he recognizes that it is a word he has heard and can interpret. And not only can the child figure out the new word faster, but because word recognition has required less time and effort, he has more attention to devote to comprehending the passage.

Imagine that a child who is an early reader doesn't know the word *rocket* and is reading the following sentence:

> When we flash you a signal you will have to open the door and bail out with the help of emergency rockets.[4]

As he sounds out rock-ets he will more quickly recognize that he has read this unknown word correctly if this word is already part of his speaking vocabulary, and he knows what it means. The context will help him know that he has deciphered the word correctly, and he will have a sense that the word fits the meaning of the sentence. Having a big mental dictionary of words facilitates reading comprehension and reading fluency, and young children acquire a big mental dictionary from having books read to them.

Continuing with our Curious George example, let's examine the vocabulary words that appear in this children's story. During the beginning scenes at the house involving the letter writing and attempted cleanup of the spilled ink, lots of rich vocabulary is used. Then while George is on the farm, completely different words are included. The story continues with more rich experiences and vocabulary as George is asked to go up in a spaceship and bail out using a parachute to land safely.

Below is a list of 28 sample words from this book. Although some of these words may be spoken in our daily interaction with our children, many are words we would not use regularly, and so the child's vocabulary expands. It has been proven that children do not typically learn such words from television, from each other, or simply from talking with adults. Reading books is the key to knowing words.

Benefit: Develops Familiarity with Rich Language Patterns

Not only is exposure to the background information and specific words in books important for children, but so is exposure to sentence patterns and special uses of language that are found only in books. The more exposure to complex and well-structured sentences, the more likely it is that the child will use such sentence patterns himself. Thus, the exposure helps not only comprehension but also speaking and writing ability as the child matures.

In the preschool years, children do not learn about sentence structure from being formally taught. They learn from listening to the patterns spoken around them and modeling their own language patterns after those of other speakers. The brain is hardwired to learn the rules and organization of a language system; all that is required is sufficient input for the brain to sort out the way words can be ordered to make sentences. As a child listens to sentence after sentence, he develops a familiarity with a range of possible sentence patterns and how ideas are communicated. The patterns become part of his internal rule system for putting words together. For example, he learns that questions can be made in different ways:

> What did George do when he could not carry the pump?
>
> *Did* George carry the pump?
>
> (With a rising voice): George didn't carry the pump?

He learns as well that some words have to go in a certain order to fill "slots" in a sentence, and others are not bound by such rules. For example, he learns where to put an adjective that modifies a noun: before the noun, unless it is part of the verb phrase. In English we say the *curious monkey*, not *the monkey curious*, although we can say *the monkey was curious*. This part of language "learning," again, is not conscious or deliberately practiced in the preschool years; it will take place with exposure to language. What is different about the language in books and the language of speech? Plenty. The language of books is much more complex. Sentences are complete in book language but tend to be incomplete and run-on in less formal conversations between people who are talking to each other face-to-face. Sentences tend to be longer and more complex in books—that is, they have clauses built into them, or they are joined by conjunctions that are carefully chosen to express an idea. They tend to be loaded with more modifiers—adjectives and adverbs—and to use correct grammar more than we do in casual speech. Printed language uses phrases and expressions in special ways that are peculiar to writing but uncommon in speech, such as the greetings and closings in letters. Finally, the way that sentences are ordered and strung together in writing is usually much more organized and less repetitious than the way we speak.

An example of well-written sentences from our Curious George book is the letter from the Professor to George, which is printed in the book, as follows:

> Dear George,
>
> A small space ship has been built by our experimental station. It is too small for a man, but could carry a little monkey. Would you be willing to go up in it?
>
> I have never met you, but I hear that you are a bright little monkey who can do all sorts of things and that is just what we need.
>
> We want you to do something nobody has ever done before: bail out of a spaceship in flight.
>
> When we flash you a signal you will have to open the door and bail out with the help of emergency rockets.
>
> We hope that you are willing and that your friend will permit you to go.
>
> Gratefully yours,
>
> Professor Wiseman
> Director of the Science Museum[5]

This passage also demonstrates some fundamentals of good letter composition. The first paragraph introduces the topic and tells why the Professor is writing to the monkey. The remainder of the letter clearly explains why a man can't go in the spaceship and why George has been invited to do this job. In addition the Professor describes what George would be asked to do. The last paragraph politely expresses the Professor's recognition that George will need his friend's permission to go.

Another example of the descriptive language appropriate for preschoolers is from the scene where they are waiting for George to react to the illuminated light and pull the lever to parachute from the spaceship. The author's writing is demonstrated in the following passage:

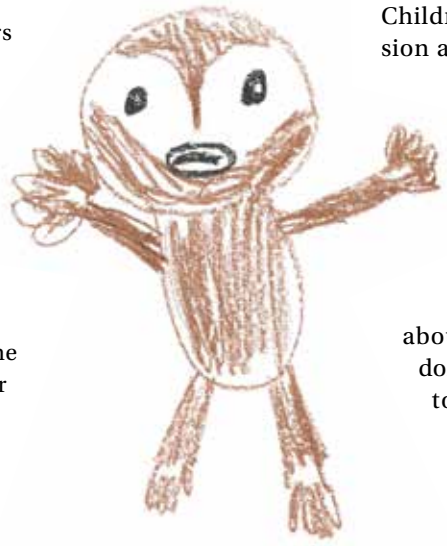
> They waited anxiously…At last George began to move.
>
> Slowly, as if in a daze, he was groping for the lever. Would he reach it in time? There—he had grabbed it!
>
> The door opened—hurrah—George was on his way!
>
> Out of the blue an open parachute came floating down to earth. The truck raced over to the spot where George would land.
>
> What a welcome for George!
>
> Professor Wiseman hung a big golden medal around his neck. "Because," he said, "you are the first living being to come back to earth from a space flight." And on the medal it said: TO GEORGE, THE FIRST SPACE MONKEY.
>
> Then a newspaperman took his picture and everybody shouted and cheered, even the farmer and his son, and the kind woman from next door (who had worked for hours to get the water out of the room).[6]

Common Characteritics of Stories

- The story has a title.
- There are characters, including a main character.
- The story takes places in a setting (time, place).
- The characters usually have a problem to solve.
- The action hinges on how the problem is solved.
- There is a resolution (climax) in the story, before it ends.
- Language is used to create the effect of surprise, sadness, climax, or humor.

In summary, children who have been read to have learned that there is a different language, or a different way of expressing ideas, in books from the way we speak. They begin to develop an "ear" for written English versus spoken English. As described by Canadian educator M. Spencer:

> Being read to offers them [children] longer stretches of written language than at any other time, and moreover, this is language put together by someone that isn't there to be seen. The reader, adult or child, lends the text a different voice, so that "I'll huff and I'll puff and I'll blow your house down" becomes a language event of a particular kind.[7]



Benefit: Develops Familiarity with Story Structure

Children absorb a great deal about story structure from hearing many stories during their preschool years. This knowledge is helpful once the child begins to read and write his own stories. It helps with reading because, knowing what to expect, children form a mental outline of the events and remember the details much more easily. It helps with writing because, knowing what the pieces are and where a story should go, the child has a mold to put his words into. Preschoolers who have been read hundreds of stories begin to understand that stories have common characteristics.

Benefit: Acquires Familiarity with the Reading Process

Children learn about what reading is from observing others read to them. For young children, early experiences of having someone read to them gives them an experience and impression about how people read. Children gain an impression about what a person does when he or she reads. Since we cannot see inside the mind, which is where the process is occurring, a child must guess about what the adult is doing. The child begins to form hypotheses about the print on the page corresponding to words that are the same

as those the child hears in speaking and listening. This correlation between print and spoken words is an important step in learning about reading.

A study that was completed by educator E.H. Hiebert examined what preschool children believe an adult is reading on the page. Children were shown a book with pictures and print and asked to point to what a reader should read. In this study it was found that three-year-old children believed that it was the pictures that were being read.[8]

There is a set of other things a pre-reading child must learn that educators refer to as "print awareness" or "learning about print." These concepts are learned from being read to by an adult who shows the child the book and interacts with the child as the story is being read aloud.

Benefit: Identifies Reading as a Pleasurable Activity

I can vividly remember the first time that I realized that reading was a great pleasure. It was during spring break of my senior year in high school, which my best friend and I spent in Florida visiting my grandparents. My friend, whose name was Madeline, tossed me her copy of Ayn Rand's *Atlas Shrugged* after she finished it. I devoured it during that week, reading late into the night several nights. Although this first "aha" experience came late for me, reading for pleasure has been a part of my life ever since. As a parent, it is my goal for my children to experience the joy of reading early in life and hopefully begin a lifelong love of reading.

Probably the most important thing about reading aloud to a child is to allow the child to experience reading as an enjoyable activity. If the child associates reading with pleasure, the child will have a greater desire to learn to read. As Jim Trelease wrote in the first chapter of his book, *The Read-Aloud Handbook*:

> Every time we read to a child, we're sending a "pleasure" message to the child's brain. You could even call it a commercial, conditioning the child to associate books and print with pleasure.[9]

Probably the most important thing about reading aloud to a child is to allow the child to experience reading as an enjoyable activity.

There are many things parents can do to make reading pleasurable. Choose a location in the home that your children especially enjoy. My children love to read on the front porch swing during the summer; they have reminded me that we read *Charlotte's Web* one summer while waiting for the camp bus to pick them up each day. Especially in the winter my children love to cuddle up next to me while listening to a story. At an educators' conference that I attended, a European speaker showed slides of historical paintings depicting scenes about reading. His point in showing over a hundred slides of paintings was that the overwhelming majority of the paintings showed the child sitting on the adult's lap while reading a story. The proximity of closeness between parent and child while reading has been captured in art over many centuries.

Choose a time when you can read for an uninterrupted period. My children are very vocal about how much they dislike it when I answer a phone call and leave them "hanging" in the middle of a key passage of a story we are reading. Get involved and be dramatic: Make the story more fun for you and your children by accentuating the animation of your voice for key lines.

It's important that parents allow their children to see them enjoying reading. When I was growing up the only thing I remember seeing my parents read was the daily newspaper. In fact I can vividly recall that my father always read the paper in his easy chair each evening after family dinner. Modeling that reading is pleasurable sends strong messages to our children.

Practical Tips about How to Make Reading Aloud Enjoyable

When Do I Start Reading to My Child?

Although Jim Trelease, in his book, *The Read-Aloud Handbook*, advises that reading to a child should start as soon as the baby is born, my personal experience was different. Although I occasionally read to my infants when they were less than 6 months old, I found it awkward to cradle my infant and try to turn the pages of a picture book. Read to your infant if it provides stimulation for you during the sometimes tedious hours you spend holding and rocking your baby. However, don't feel compelled to read at this stage if you find it more rewarding to look into the child's eyes and talk to him instead. There's plenty of time to read later.

6–9 Months

Beginning to read to a child around 6–9 months of age is ideal. The child is sitting up and can hold small board books at this stage. It is great to allow a child to begin exploring books by himself during quiet moments in the crib or on the floor. Wonderful vinyl books are available, which are more durable when the child is slobbering during the teething stage. Place the more fragile board books with pop-out sections on the bookshelf to be saved for reading together. Keep several small books among your child's toys that are the right size and

Concepts a Child Must Learn about Print

- How the book is turned when it is "right side up"
- That the print is read, not the pictures
- Where the beginning of the book is
- The order of reading the print on a page— top to bottom—left to right
- What to do at the end of a line
- What to do at the end of a page

shape for him to turn the pages and carry without help from you. Rotate the books so that he doesn't grow bored with them.

12–18 Months

By the age of 12–18 months your goal is to have your child bring books to you, signaling he wants you to read him a story. It's a thrill to see your child with book in hand and arms lifted telling you that he wants to come up on your lap to hear the story he has chosen. This event signals that he enjoys listening to a story.

It is important to make reading times enjoyable ones; therefore, like so many other things in parenting, choosing the appropriate time and occasionally waiting for the child to be ready can be critical. When my active toddler son squirmed to get off my lap, I decided not to force it. Although I was anxious to begin reading to him, I decided to wait to avoid risking that his experience of reading would be negative. If your child wants to turn the pages faster than the words can be read, abandon reading the story as written and make up a story that corresponds with the pictures. Even with the very simple small board books of about a dozen pages with few words, discuss the pictures and talk about all the things your child sees on each page. Your dialogue about each page should take longer than the actual time to read the words on the page.

2 Years of Age

Establish a routine by the time your child is two years old that you always read a story at bedtime. This routine is important because even if you spend no other time reading during the day, at least this 15 minutes per day occurs religiously. While our child still slept in a crib, our favorite spot for bedtime reading was in a rocking chair in his room with the door closed to avoid interruption. In our family the routine of a bedtime story has continued to this day, and our children are 11 and 8 years old. Our pattern is that on nights when both parents are home at bedtime, one parent reads to one child. The pair then is swapped on the following night so that Dad reads to daughter one night and to son the next night, and Mom does vice versa. Bedtime stories will hopefully continue in our house until as long beyond age 10 as possible. After that age, the child may prefer to read to himself before bed.

> The children of parents trained for only one hour in interactive story reading improved dramatically in verbal expression and vocabulary.

6–8 Years of Age

Once the child is able to read himself, change the routine by having the child read for 15 minutes, followed by the parent reading to the child for 15 minutes. A child needs to practice to learn to be a good reader. If your child is a reluctant reader, have him read from a book on his reading level before you read to him from a book that is somewhat above his own reading level. When children are first learning to decode the words, there will be a gap between what they are able to read themselves and what they enjoy hearing read aloud. Encourage your child to practice reading books he can read comfortably. Then, it is important for the parent to continue reading to the child from books above the child's reading level in order to expand his background knowledge and enjoyment of literature.

What If My Child Resists Being Read To?

The intimacy of shared reading is not always easy to capture. When my son was a toddler it was difficult to feel close during our regular reading time. He was a very active child who frequently squirmed to get down from my lap because he had a greater interest in gross motor activities than in sitting. If your child isn't interested in hearing a story, abandon the effort and try again at another time. Do not push the issue, and he will eventually come back to reading. Choose when to offer to read him a story, and select very short stories initially, thereby matching the child's attention span. Select books on topics about which your child is keenly interested. Ease your child into longer and longer stretches of reading time.

When Do I Stop Reading Aloud?

Many parents believe that once their child begins to read himself, the days of reading storybooks aloud are over. However, there are some very important reasons for continuing to read to your child as he begins to learn to read. Especially in first and second grade while the child is learning to read, his listening level far exceeds his reading level; that is, he can understand passages read to him that far exceed what he is capable of reading himself. Continue to expose your child to good literature that mentally challenges him and enables his vocabulary and knowledge to continue growing. Do this as long as it is fun. Once children prefer to read silently, everyone can share a "Drop Everything And Read" (DEAR) time in the evening.

What Do I Do If My Child Wants To Look Ahead at the Pictures Before We Read?

As frustrating as looking ahead may be to the parent, most educators would encourage you to allow looking ahead at the pictures. This exercise helps the child to activate background knowledge about the setting and topic of the story. In first-grade reading instruction, teachers usually take time to introduce a story before they begin reading it. Children are taught to think about the title of the book and anticipate what the story might be about. Typically a discussion is initiated about the topic of the book. If the story is about going to the zoo, the teacher leads a discussion about what you are likely to see at the zoo. Children will name the animals found at a zoo, as well as discussing the activities one might see, such as zookeepers feeding the animals. The purpose of this discussion is to activate

prior knowledge for the children who have visited the zoo and to provide information to any child who has no prior information about this experience.

What Comes After Picture Books?

Before your child reaches age seven you will begin reading aloud chapter books that don't have pictures. *Charlotte's Web*, a story written by E.B. White about the friendship between a spider and a pig, is a wonderful example of a chapter book appropriate for this age. The vocabulary is challenging and interesting, and the story is captivating for the child. There is plenty of background knowledge presented while the child is thoroughly entertained. Other books we enjoyed included *Mr. Popper's Penguins, The Indian in the Cupboard*, and The American Girl Collection books.

After your child can read himself, continue to look for opportunities to read aloud to your child. This can be done through round-robin reading of a classic book in front of the fireplace or through alternate oral reading—first the parent, then the child, switching every page or two—to foster better comprehension. It will also enable the family to have active discussions about the characters and the author's intended meaning. Your own love of literature will continue to be communicated through shared reading activities. Remember and find the books you loved as a child. Enjoy them again as you share them with your child.

Interactive Story Reading

Have you ever felt frustrated when your child wants to stop you to ask questions while you are reading a story to him? When my children were preschoolers, I found it frustrating to be constantly interrupted by all their comments about the pictures and questions about the story. I decided that limiting the interruptions was a good thing, because when the child starts school his teacher wouldn't want to be stopped by incessant questions from 25 children. It also seemed that staying "on task" was an admirable skill to be learned.

However, this dialogue during the story reading is actually very positive and is something to be encouraged and developed. As described in *Becoming a Nation of Readers*, active discussion during reading is important:

> The benefits are greatest when the child is an active participant, engaging in discussions about stories, learning to identify letters and words, and talking about the meanings of words. One researcher who observed parents reading books to their children discovered differences in the quality and quantity of informal instruction that the parents provided.[10]

The importance of engaging the child as an active listener, rather than the parent reading the story from beginning to end without pause, has been researched by other educators. The most interesting of these was a study completed by G. Whitehurst and his colleagues in 1988, which demonstrated the impact of active engagement. In their study they provided training to the parents of 15 middle-class preschool children from two to three years old. The parents received a one hour training session in interactive story reading in which they were shown how to engage in this technique. They were instructed to:

- pause periodically and ask open-ended questions.
- suggest alternative possibilities.
- pose progressively more challenging questions.

An example of an open-ended question is "What is Curious George doing?" or "Why do you think he is doing that?" The key is to ask questions that cannot be answered with a yes/no response. A control group was identified with children of approximately the same age and language development. The parents of both groups tape-recorded their reading sessions for one month.

The tapes confirmed that both groups read equally often (about eight times per week) and that the trained parents followed the instructions for interactive story reading. The children in both groups were tested before and after the experimental month. The results showed that at the end of one month of interactive story reading the children in this group versus the control group:

- improved 8.5 months in verbal expression, and
- were six months ahead on a vocabulary test.[11]

The verbal expression measure assessed the child's capability in expressing ideas verbally. These are staggering results for children who have an average age of 30 months! Think what effect using an interactive story reading approach might have over several years, versus the one month of this study.

Reading aloud to a child is a critical activity in helping a child gain the knowledge and language skill that will enable good comprehension later on. Reading aloud increases background knowledge, builds vocabulary, and familiarizes children with the language in books. The Commission on Reading has advised that not only does reading aloud to a child make a difference, but the way parents read aloud matters. A book becomes a vehicle for using language—before, during, and after reading. In addition to reading aloud, engaging in probing conversations at home can help the child acquire the language skills needed to become a good reader. ☐

Endnotes

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Building Knowledge

The Case for Bringing Content into the Language Arts Block and for a Knowledge-Rich Curriculum Core for all Children

By E. D. Hirsch, Jr.

"I am sure that the power of vested interests is vastly exaggerated compared with the gradual encroachment of ideas.... Soon or late, it is ideas, not vested interests, which are dangerous for good or evil."

–J. M. Keynes, *The General Theory of Employment, Interest, and Money*

Consider the following sentence, which is one that most literate Americans can understand, but most literate British people cannot, even when they have a wide vocabulary and know the conventions of the standard language:

> Jones sacrificed and knocked in a run.

Typically, a literate British person would know all the words in the sentence yet wouldn't comprehend it. (In fairness, most Americans would be equally baffled by a sentence about the sport of cricket.) To understand this sentence about Jones and his sacrifice, you need a wealth of relevant background knowledge that goes beyond vocabulary and syntax—relevant knowledge that is far broader than the words of the sentence. Let's consider what we as writers would have to convey to an English person to make this sentence comprehensible.

First, we would have to explain that Jones was at bat. That would entail an explanation of the inning system and the three-outs system. It would entail an explanation of the size and shape of the baseball field (necessary to the concept of a sacrifice fly or bunt) and a digression on what a fly or a bunt is. The reader would also have to have some vague sense of the layout of the bases and what a run is. By the time our English reader had begun to assimilate all this relevant background knowledge, he or she may have lost track of the whole point of the explanation. What was the original sentence? It will have been submerged in a flurry of additional sentences branching out in different directions.

The point of this example is that knowledge of content and of the vocabulary acquired through learning about content are fundamental to successful reading comprehension; without broad knowledge, children's reading comprehension will not improve and their scores on reading comprehension tests will not budge upwards either. Yet, content is not adequately addressed in American schools, especially in the early grades. None of our current methods attempt to steadily build up children's knowledge; not the empty state and district language arts standards, which rarely mention a specific text or piece of information; not the reading textbooks, which jump from one trivial piece to another; and not the comprehension drills conducted in schools in the long periods of 90–120 minutes devoted to language arts. These all promote the view that comprehension depends on having formal skills rather than broad knowledge.

This may sound like an academic point. It is, in fact, an important argument about the science that underlies learning. I believe inadequate attention to building students' knowledge is the main reason why the reading scores of 13- and 17-year-olds on the National Assessment of Educational Progress have not budged in years. I believe this neglect of knowledge is a major source of inequity, at the heart of the achievement gap between America's poor and non-poor. I also believe that if this idea

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about what is limiting students' comprehension isn't understood and aggressively addressed, reading scores won't move up, no matter how hard teachers try. And the public debate will wrongly continue to pillory teachers and public schools for stagnant achievement scores.

In the pages that follow, I want to make the following argument: First, that the implicit model currently used to improve reading comprehension is based on faulty, but commonplace, ideas. Second, that a more scientifically accurate picture of reading comprehension exists—and it puts background knowledge and vocabulary, along with fluent decoding ability, at the center of reading comprehension. Third, we can identify the knowledge that is most useful to reading comprehension. Fourth, if we accept these premises, we are obliged to revise the early grades curriculum so that we can impart to all students, in language arts classes and throughout the day, the knowledge that will enable them to read with strong comprehension. And, finally, if we do this, we will help all students become strong comprehenders of high-level texts, and we will disproportionately help our most at-risk students.

I. The Wrong Ideas That Underlie Our Approach to Teaching Reading Comprehension

When I began college teaching in the 1950s, my academic specialty was the history of ideas. I also specialized in the theory of textual interpretation, which, reduced to its essence, is the theory of reading. So I became well-versed in the scientific literature on language comprehension and in American and British intellectual history of the 19th century. This double research interest prepared my mind for disturbing insights about American schooling. I saw that John Maynard Keynes's remark about the power of ideas over vested interests was profoundly right. Root ideas are much more important in practical affairs than we usually realize, especially when they are so much taken for granted that they are hidden from our view.

In American education, the ideas that influence us, though often hidden from view, come to us from the intellectual movement known as Romanticism, which held great sway during our country's formative years. It is thanks to the Romantics (also known as transcendentalists, pragmatists, and, in education, progressives) that the word "natural" has been a term of honor in our country and that the ideas of "nature" and "natural" were elevated to a status that previously had been occupied only by divine law. We can hear these romantic beliefs in John Dewey's writings, which continually use the terms "development" and "growth"—terms that came as naturally to him as they do to us.

Being trained in the history of ideas, I had become familiar with the way in which unnoticed metaphors like "growth" and "development" unconsciously govern our thought—and continue to do so, even when scientific evidence clearly shows that one of the primary goals of education, reading, is not a natural development at all.

Let's ponder "development" for a moment. When a fertilized egg turns into an embryo, that development is indeed something that unfolds naturally. Similarly, in the first two years of life, when a child learns to walk and talk, those are natural developments. Since the child acquires these extremely difficult skills often without conscious adult instruction, we might mistakenly extend trust in natural unfolding to the next stage of life—when a child enters school. And we might expect that given loving exposure to lots of books, a child might learn to read with little explicit instruction in reading mechanics. Hence, the whole language movement, which for so many years led many teachers, teacher educators, textbook publishers, and administrators to neglect decoding and other early reading mechanics.

A naturalistic approach to teaching decoding is not, however, the most deleterious Romantic idea influencing the teaching of reading. The most harmful idea is that children do not need a knowledge-rich curriculum to become proficient readers. The word reading, of course, has two senses. The first means the process of turning printed marks into sounds and these sounds into words. But the second sense means the very different process of understanding those words. Learning how to read in the first sense, as vital as it is, does not guarantee learning how to read in the second sense, comprehending the meaning of what is read. To become a good comprehender, a child needs a great deal of knowledge. A Romantically inspired long delay in beginning to teach that knowledge is socially and economically harmful to our students—especially our most disadvantaged students.

Disparagement of factual knowledge, as found in books, has long been a strong current in American thought. Henry Ford's famous dictum, "History is bunk," is a succinct example. Since the 19th century, such anti-intellectualism has been as American as apple pie, as the great historian Richard Hofstadter has pointed out, and it came straight out of the Romantic movement into our schools.[1]

Instead of a respect for the importance of knowledge, Romanticism gave us faith in the half-truth that the most important thing for students to learn is "how to learn." It bequeathed to us a tendency to dismiss the acquisition of broad knowledge as "rote learning" of "mere facts," to subtly disparage "merely verbal" presentations in books and by teachers, and to criticize school knowledge unless it is connected to "real life" in a "hands-on" way. These ideas are now so commonplace that we don't think twice about them; we don't scientifically scrutinize them. Yet, these ideas underlie what we as a nation think about reading comprehension.

Pick up a typical basal reader and the clear implication is that comprehension

skill depends on formal "comprehension strategies," such as predicting, summarizing, questioning, and clarifying.[2] Look in them fruitlessly to find evidence that the publishers believe reading depends on imbibing a body of knowledge. I call this Romantic idea "formalism"—a belief that reading comprehension can best be improved by acquiring formal comprehension strategies, not by building children's knowledge base.

This idea is ruinous to reading instruction. It is sabotaging efforts to raise reading comprehension scores. It is causing citizens to question the quality of their schools and is leading policymakers to blame school staff for reading failures. It is time to fault the idea, not the teachers and the students who are doing their best.

These Wrong Ideas Underlie Reading Textbooks and Distort the Use of Classroom Time

Publishers now spend tens of millions of dollars to produce—and schools hundreds of millions to buy—reading programs that are constantly being upgraded and revised. But the guiding ideas behind these programs are typically formalistic and almost indistinguishable from one another. Although the editors of several of these programs have strong credentials in education or psychology, the programs are far from up-to-date with regard to the relevant consensus in cognitive science. For instance, cognitive scientists agree that reading comprehension requires prior "domain-specific" knowledge about the things that a text refers to, and that understanding the text consists of integrating this prior knowledge with the words in order to form a "situation model."[3] Constructing this mental situation model is what reading comprehension is. But, existing reading programs, while they may pay lip service to this finding about the need for relevant background knowledge, fail to systematically exploit this fundamental insight into the nature of reading. (See "How We Neglect Knowledge—and Why" in the Spring 2006 issue of *American Educator*.) Hundreds of pages of basal text offer up trivial stories that provide little opportunity for children to build their store of knowledge. They persist, unit after unit, in asking students to "predict," "summarize," "infer," etc.—as if endless use of these strategies will increase students' reading comprehension ability.[4]

Here's an example of how these ideas and practices affect real children in real classrooms. In May 2004, a front-page story in the *Washington Post* described the activities in a third-grade classroom at a public school in Maryland, which the reporter, Linda Perlstein, identified as being typical of activities "across the nation." Perlstein had been sitting in classrooms at the school, observing what went on and talking to students, teachers, and administrators. The piece begins with a comment by one of the students:

> Here is 9-year-old Zulma Berrios's take on the school day: "In the morning we read. Then we go to Mrs. Witthaus and read. Then after lunch we read. Then we read some more."

These reading periods, Perlstein points out, come at the expense of classes in history, science, and art. The reading materials themselves are quite vapid. In this particular class, the children were reading a book about a grasshopper storm. But the point of the class was not to learn anything in depth about grasshoppers; the point was to learn how to ferret meaning out of a text by using formal "strategies." Perlstein writes:

> For 50 minutes, Tracey Witthaus pulls out a small group of third-graders—including Zulma—for Soar to Success, an intensive reading-comprehension program used at many county schools. Instead of studying school desegregation and the anniversary of *Brown v. Board of Education*, Zulma's group finishes a book about a grasshopper storm and practices reading strategies: predict, summarize, question, clarify. "Clarify," said Zulma, who began the year reading at the late first-grade level.

The theory behind these deadening activities is that learning comprehension strategies will give students a shortcut to gaining greater expertise in reading. Supposedly, learning such strategies will quickly provide the skills they need to comprehend unfamiliar texts. But as the teachers in the school pointed out to the reporter, the methods did not seem to be working. Reading scores were not going up significantly. Perlstein reports that "staff members said they aren't sure what they might be doing wrong."

The idea that reading skill is largely a set of general-purpose maneuvers that can be applied to any and all texts is one of the main barriers to our students' achievement in reading. It is true that students benefit from learning and practicing reading comprehension skills, but a key point has gotten lost: More training in these skills is not necessarily better. A meta-analysis has shown that six classes of comprehension skill instruction has the same effect as 25 classes.[5] (This is emphatically not to suggest that some of the methods, such as asking students questions about important content they have read, would be a bad idea. Of course teachers do and should ask students to engage with reading material in a variety of ways, including questioning students about the author's intent, summarizing what they've read, and so forth. The ineffectiveness of an emphasis on strategy arises from two sources: first, conscious strategizing takes up limited mental space that otherwise could be devoted to meaning; second, the skills are being practiced apart from important content. When the questions are asked about trivial content, when learning these strategy skills becomes the end—not the means—for engaging content, and when the time devoted to skills training drives needed content out of the classroom, then reading comprehension is not effectively advanced.) Formal comprehension skills can only take students so far; knowledge is

It is time to fault the idea, not the teachers and students.

what enables their comprehension to keep increasing. The staff and children at the school Perlstein visited do not need more skills training. They need a revolution in the ideas that now drive reading comprehension instruction.

II. Reading Comprehension Depends Mainly on Knowledge and Knowledge-Related Vocabulary

Recently, schools have begun to do a much better job of teaching all children to become good first-step readers who can turn printed symbols into sounds and words quickly and accurately, a process called decoding. The importance of systematically and effectively teaching decoding cannot be overstated (and the role played by AFT members in making such instruction better understood and more commonplace can hardly be overstated either). But becoming a skilled decoder does not ensure that one will become a skilled reader. There are students who, after mastering decoding, and reading widely can, under the right circumstances, gain greater knowledge and thence better reading comprehension. But such gains will occur only if the student already knows enough to comprehend the meaning of what he or she is decoding. Many specialists estimate that a child (or an adult) needs to understand a minimum of 90 percent of the words in a passage in order to understand the passage and thus begin to learn the other 10 percent of the words.[6] Moreover, it's not just the words that the student has to grasp the meaning of—it's also the kind of reality that the words are referring to (think of our baseball example).[7] When a child doesn't understand those word meanings and those referred-to realities, being good at sounding out words is a dead end. Reading becomes a kind of Catch-22: In order to become better at reading with understanding, you already have to be able to read with understanding.

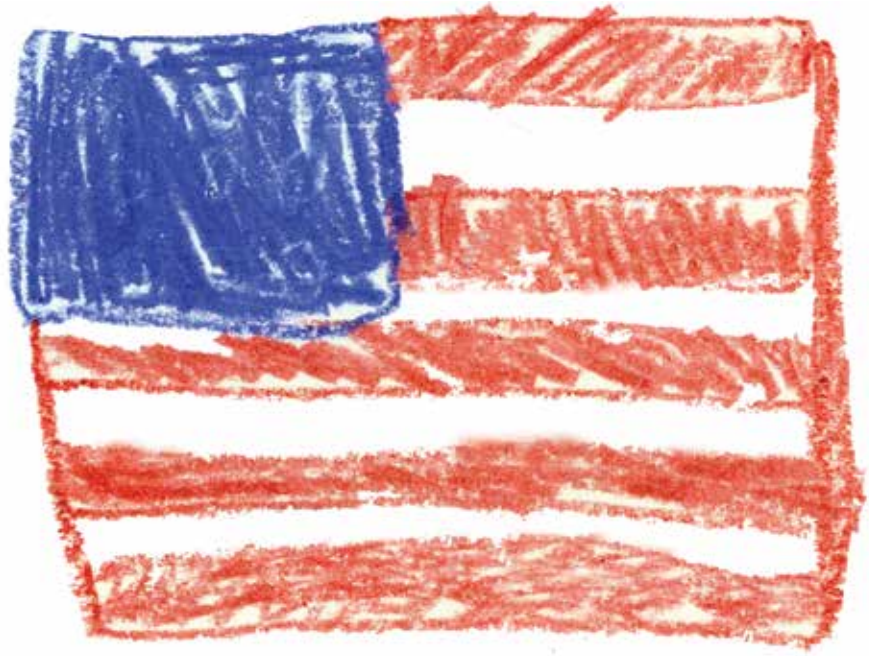
Long before Joseph Heller's *Catch-22*, this idea was implied in the Gospel of Matthew, which stated that those who already have shall gain more, while those who have not shall be taken away even what they have. Alluding to this Biblical passage, cognitive scientists and reading researchers have spoken of the "Matthew effect" in reading. Those who already have good language understanding will gain still more language proficiency, while those who lack initial understanding will fall further and further behind.[8]

"Filling in the Blanks": Why Reading Comprehension—and Reading Comprehension Tests—Require Broad General Knowledge

As scientists have probed more deeply into the nature of language comprehension, they have discovered that what the text implies but doesn't say is a necessary part of its understood meaning. In fact, what the text doesn't say often far exceeds what it says. Just as with "Jones sacrificed and knocked in a run," the reader or listener has to fill in the blanks and make the unstated connections. This is hardly a new observation. The ancient Greeks knew it, and Aristotle even gave the phenomenon a name—enthymeme—which is technically a syllogism with some of the logically necessary steps left out.[9] For instance, if I say, "All men are mortal, so Socrates is mortal," everyone will understand what I say. But that is because their relevant knowledge enables them to supply the missing inference: "Socrates is a man."

To different extents, all speech has these blank spaces. Cognitive psychologists have determined that when a text is being understood, the reader (or listener) is filling in a lot of the unstated connections between the words to create an imagined "situation model" based on domain-specific knowledge.[10] This situation model constitutes the understood meaning of the text. Take, for example, this passage from my book *What Your Second-Grader Needs to Know:*

> In 1861, the Civil War started. It lasted until 1865. It was American against American, North against South. The Southerners called Northerners "Yankees." Northerners called Southerners "Rebels," or "Rebs" for short. General Robert E. Lee was in charge of the Southern army. General Ulysses S. Grant was in charge of the Northern army.



Potentially, this passage is usefully informative to a second-grader learning about the Civil War—but only if he or she already understands much of what's addressed in it. Take the phrase "North against South." A wealth of preexisting background information is needed to understand that simple phrase—going far beyond the root idea of compass directions, which is simply the necessary first step. The child needs a general idea of the geography of the U.S. and needs to infer that the named compass directions stand for geographical regions. Then a further inference or construction is needed: The child has to understand that the names of geographical regions stand for the populations of those regions and that those popu-

lations have been organized into some sort of collectivity so they can raise armies. That's just an initial stab at unpacking what the child must infer to understand the phrase "North against South." A full, explicit account of the taken-for-granted knowledge that someone would need to construct a situation model for this passage would take many pages of analysis.

To understand language, whether spoken or written, we need to construct a situation model consisting of meanings construed from the explicit words in the text, as well as meanings inferred from relevant background knowledge. The spoken and the unspoken taken together constitute the meaning. Without this relevant, unspoken background knowledge, we can't understand the text.

That is why we are able to understand some texts but not others—no matter how well we can decode the words (imagine trying to understand a technical article on astrophysics). Since relevant, domain-specific knowledge is an absolute requirement for reading comprehension, there is no way around the need for children to gain broad general knowledge in order to gain broad general proficiency in reading.

Among experts on reading, there's one group that understands this particularly well—the makers of standardized reading comprehension tests. Such tests always include a diversity of passages on quite different subjects. Why? Through experimentation, test makers found that such variety is absolutely critical to the validity and reliability of the tests. If they sampled just one kind of subject matter, their tests would prove to be inaccurate as measures of general reading ability. Because of the inevitable influence of background knowledge, someone who reads well about the Civil War may not necessarily read well about molecular interactions. If a test is to measure general reading ability, it must include passages that sample a person's general knowledge of several kinds of subjects. (For more on reading comprehension tests, see "What Do Reading Comprehension Tests Mainly Measure? Knowledge" in the Spring 2006 issue of *American Educator*.)

Why Building Vocabulary Is Vital and Why It Is Largely Built through Broad Exposure to Content Knowledge

Comprehending a text depends on knowing the meanings of most of its words. An adequate early vocabulary is, therefore, fateful for later reading achievement. Other things being equal, the earlier children acquire a large vocabulary, the greater their reading comprehension will be in later grades. Vocabulary growth is a slow process that gradually accumulates a very large number of words and, therefore, must be fostered intensively in the earliest grades if we are to bring all children to proficiency in reading as quickly as possible. Anne Cunningham and Keith Stanovich have shown that under current conditions of American schooling, vocabulary in second grade is a reliable predictor of academic performance in 11th grade.[11] They have also shown that the biggest contribution to the size of any person's vocabulary must come from the printed page (whether it is heard or read), because print uses a greater number of different words than everyday oral speech does.[12]

That a person has learned roughly 60,000 to 100,000 words by 12th grade is one of the most remarkable feats of the human mind. Even though how we do it remains something of a psychological mystery, recent work has taught us enough about vocabulary growth to formulate some conclusions about the most productive means of enlarging children's vocabularies, especially among students whose initial vocabularies are relatively small.

> What the text doesn't say often far exceeds what it says. The reader has to fill in the blanks.

One critical finding is that word learning takes place most efficiently when the reader or listener already understands the context well. For example, researchers have found that we learn the words of a foreign language most effectively when the subject matter is familiar.[13] If you read in French that "Lyon a battu Lille," you will make greater gains in learning what battu means if you know something about soccer. This finding appeals to common sense. You can guess accurately what the word ought to mean in the context because you know what is being talked about. This picture of how words are learned in context is supported by recent research, which shows that we infer the meanings of words by grasping the whole meaning of the utterance in the form of a mental situation model. If we are hearing a story about a team of firefighters putting out a fire and we encounter the word flames for the first time, we can make a good guess about what it means because we understand the situation referred to in the sentence in which flames is used. We must grasp this whole situation (precisely or vaguely) when we understand what is said or written. This understanding of the whole context is the basis for guessing the meanings of new words. This fact explains why we learn words up to four times faster in a familiar context than in an unfamiliar one.[14] An optimal early reading program will exploit this characteristic of word learning by ensuring that the topics of class read-alouds, independent reading, and discussion are consistent over several class periods, so that the topic will become familiar to the students and thus accelerate word learning.

Why a Knowledge Focus Will Disproportionately Help Disadvantaged Children

The Matthew effect in reading, whereby the rich get richer and the poor get poorer, is inevitable in the case of vocabulary and knowledge. As we've seen, experts say that we need to know at least 90 percent of a text's words to understand it.[15] Children who already have sufficient word knowledge will understand the text and begin learning the meanings of the other 10 percent of the words as well as acquire new knowledge through their reading. But those students who know only 70 percent of the words will not understand the text

(and thus, will neither begin learning the other 30 percent of the words, nor acquire knowledge from the text). Now, after looking at the text, they are further behind the advantaged group than they were before they read the text. If this pattern continues, the gap between the two groups will grow with each successive language experience.[16]

Let's focus for a bit on the subject of speeding up word learning for disadvantaged children. Between the ages of 2 and 17, an advantaged child learns an average of 10 to 15 new words a day.* But the growth in vocabulary is not linear: No one learns the same number of words every day, week, or year. The number of new words gained per unit of time is rather small at age 2, and it rises with each succeeding year. In later life, when people already know most of the words they hear and read, the number of new words they gain per year slows down again.[17]

This nonlinear pattern of vocabulary growth allows us to make a hopeful qualification of the Matthew effect in reading comprehension. Vocabulary growth in the typical school is similar to the growth of money in an interest-bearing bank account. Suppose the interest on money is compounded at 5 percent a year. Somebody who starts out with just $10 in an account will fall further and further behind somebody who starts out with $100. After 10 years, the initial difference of $90 will become a larger difference of $146. That is because the growth rates stay the same for both accounts and the supply of money is not limited. That pattern, unfortunately, describes the vocabulary gap between advantaged and disadvantaged students—it widens over time.[18] Potentially, though, schools could alter this pattern because the rates of vocabulary growth in the two students do not have to be identical. If a student who is behind in word knowledge can be brought to know 90 percent of the words that she hears and reads in school, then she can pick up new words at a faster rate than the advantaged student who already knows 95 percent of the words heard and read in school. This is because the former child is getting more opportunities to learn new words since she is further from a point of diminishing returns.

Besides this structural possibility for narrowing the vocabulary gap, there is a further opportunity for catching up, depending on the special richness of the vocabulary being studied in school. That is because the vocabulary heard in school is potentially richer than the vocabulary heard outside school. Oral speech tends to use a smaller vocabulary than written speech.[19] Almost all of the rare words that we know have been gained from print—print that we read silently or that is read aloud to us.[20] If school conditions provide enough context familiarity to speed up the learning of these rarer words for all groups, then the relative gain by the disadvantaged groups will be greater and the gap will be narrowed.

III. What Knowledge and How Much?

Such is the case for the fundamental, inescapable importance of substantial, broad background knowledge for reading comprehension (and for performing well on reading comprehension tests). But agreement on this begs the next question: Knowledge of what? What knowledge should the schools be responsible for teaching to all kids? I believe that part of the answer is quite straightforward, and I hope uncontroversial—and to teach it ought to take about 40–60 percent of curricular time. I will return to this question in a moment and explain how I think we should answer it.

But beyond this central core of knowledge that all students should know, how should the rest of students' curricular time be spent? Exactly how much emphasis should schooling give to a particular event, individual, or historical trend? The answers to these questions will always be somewhat subjective. Individuals from different regions and from different religious, ethnic, and racial backgrounds may have particular views about what the proper emphases should be. In addition, local districts, states, schools, and individual teachers will have particular ideas about what should be taught, given their particular histories and their own knowledge of what is interesting, relevant, and useful to the students in their schools and classes. Part of the curriculum, perhaps about half, should be reserved for topics that have local resonance. Different locales will make different choices and the debates over those choices will no doubt be lively and interesting—and hopefully enrich our

*Of course, the figure of 10 to 15 new words a day is not a description of the actual process of word learning. It is an average number, arrived at by taking the number of words that a superior student knows at age 17 and dividing that number by the number of days the student has lived from age 2 to age 17. Children actually gain vocabulary in fits and starts with advances and retreats and slow progress in small increments along a broad front. Words aren't learned through one or even two exposures; knowledge of what words mean and how they can be used gradually accumulates.

children's education in many ways.

But while we pursue these debates and encourage local areas to make different choices about how to allocate this portion of the curriculum, let's also move quickly to identify what should be in the half of the curriculum that all students deserve to be taught. The question that we need to answer is what must students learn so that as adolescents and adults they are able to comprehend written and spoken material aimed at educated general audiences—newspaper stories of civic interest, political debates, popular books and magazines, entry-level college texts, job-related reading, high school exit tests and SATs, directions and commentaries by employers, testimony heard by juries, etc. Students who possess this knowledge are prepared to participate in civic life, move up career ladders, succeed in college, converse confidently with a wide variety of Americans with whom they work or socialize, and generally have the esteem that comes with being regarded as an educated person.
So, again the question: What knowledge?

Students Need the Knowledge That Allows Them to Read Material Aimed at a "General Audience"

To sketch an answer to the question of what knowledge, we need a good understanding of the notion of the "general audience." When we say we want to educate good readers, we don't mean that we expect them to read a treatise aimed at physicists or constitutional scholars; we mean that we expect them to be good "general readers." But what does that mean? It sounds almost circular, but it means that they possess the shared knowledge that is assumed by individuals who communicate with an educated general audience.

Every newspaper and book editor and every producer for radio and TV is conscious of the need to distinguish what can be taken for granted from what must be explained. Learning the craft of writing is bound up with learning how to gauge what can be assumed versus what must be explained. The general reader that every journalist or TV newscaster must imagine is somebody whose relevant knowledge is assumed to lie between the total ignorance of a complete novice and the detailed knowledge of an expert. A newspaper baseball story cannot assume an audience as uninformed about the game as our imagined British person or one consisting of baseball experts. Every person who speaks and writes must make an estimate of what can be left unexplained and what must be explicitly stated. Proficiency in reading (and listening, speaking, and writing) requires possession of the broad knowledge that the general reader is assumed to have.

Here are the first three paragraphs of an article by Katherine Greider, taken at random from the City Lore section of the *New York Times* on November 13, 2005. It is an example of writing addressed to a general reader that a literate American high school graduate would be expected to understand.

> As the civil rights figure Rosa Parks lay in state in the Capitol Rotunda two weeks ago, her 19th-century Northern forerunner, a young black schoolteacher who helped integrate New York's transit system by refusing to get off a streetcar in downtown Manhattan, rested in near-perfect obscurity.
>
> Mrs. Parks's resistance on a bus became a central facet of American identity, a parable retold with each succeeding class of kindergartners. But who has ever heard of Elizabeth Jennings?
>
> The disparity is largely an accident of timing. Thanks to television, Americans around the country became a witness to events in 1955 in Montgomery, Ala.; by contrast, Jennings's supporters had to rely on a burgeoning but still fragmented mid-19th-century press. By 1955, when Parks refused to be unseated, segregation was emerging as an issue the nation could not ignore. When Jennings, 24, made her stand, on July 16, 1854, the first eerie rebel yell had yet to rise from a Confederate line. Segregation was a local or perhaps a regional story. It was slavery that was tearing the nation apart.

This example shows that the background knowledge required to understand the general sections of the *New York Times*, such as the City Lore section, is not deep. It is not that of an expert—of course not, for we cannot all be experts on the diverse subjects that are treated by newspapers. If publishers want their papers to be sold and read widely, they must not assume that their readers are experts. They may take for granted only the relevant background knowledge that a literate audience can be expected to possess.

Other things being equal, the earlier children acquire a large vocabulary, the greater their reading comprehension will be in later grades.

What do readers need to know in order to comprehend this passage? First and foremost, we need to know who Rosa Parks was—indeed, the author suggests that those who do not know of Rosa Parks are less knowledgeable than the typical kindergartner. We need to have at least a vague semantic grasp of key words like *integrate, streetcar, obscurity, parable, disparity*, and *segregation*. We must be able to picture "a burgeoning but still fragmented" press and grasp how it contrasts with 1955 television's ability to make Americans a "witness" to events. We need to know some of the things mentioned with exactness, but not others. The author clearly does not expect us to know who Elizabeth Jennings was—but we are expected to know enough about Parks to immediately grasp what Jennings faced when she refused to get off a streetcar. The mere mention of Montgomery, Ala., is assumed to trigger a flood in our minds of facts, film footage, and photos from the bus boycotts. Likewise, the words "rebel yell" and "Confederate line" are assumed to fill our minds with facts and photos from the Civil War. Note, however, that more knowledge is assumed with regard to Montgomery in 1955 than Man-

hattan in 1854: Greider reminds us that segregation was at best a regional issue in Jennings's time. Consider the knowledge domains included in this list. Montgomery belongs to history and geography; so does the North. The two means of communication and the two means of transportation belong not only to history, but also to technology. Civil rights and Parks lying in state belong to history, current events, and politics. We may infer from this example that only a person with broad general knowledge is capable of reading with understanding the *New York Times* and other such newspapers.

Reading achievement will not advance significantly until schools recognize and act on the fact that it depends on the possession of a broad but definable range of diverse knowledge. Our sketch of the background knowledge needed to understand Greider's short passage offers clues to the kind of instruction that is needed to advance general reading comprehension ability. It will be broad instruction in the worlds of nature and culture that will build the necessary platform for gaining deeper knowledge through listening and reading.

What Knowledge Is Necessary to Be a Good General Reader?

The knowledge that exists in the world and could, in theory, be targeted toward children is infinite. How can we identify what portions of that knowledge are best to help students become strong general readers? My colleagues Joseph Kett and James Trefil and I set out to define an answer that would provide useful guidance for schools. We asked ourselves, "In the American context, what knowledge is taken for granted in the classroom, in public orations, in serious radio and TV, in books and magazines and newspapers addressed to a general audience?" We considered and tried out various scholarly approaches to this problem.

Ultimately, we determined that the best way to answer this question was by asking professional speakers and writers (including, for example, lawyers, who must convince juries, and newspaper reporters) what specific items of knowledge they take for granted when they speak and write. We then used a process that involved regional groups of teachers, as well as administrators, representatives from education and other groups, a multicultural advisory group, and scholars from relevant disciplines to review the critical material, to add to it, and to subtract from it. From people in every region of the country we found a reassuring amount of agreement on the substance of this taken-for-granted knowledge.

Several years after our compilation of such knowledge was published, independent researchers investigated whether reading comprehension ability did in fact depend on knowledge of the topics we had set forth. The studies showed an unambiguous correlation between knowledge of these topics and reading comprehension scores, school grades, and other indexes of reading skill.[21] One researcher investigated whether the topics we set forth as taken-for-granted items are in fact taken for granted in newspaper texts addressed to a general reader. He examined the *New York Times* by computer over a period of 101 months and found that "any given day's issue of the *New York Times* contained approximately 2,700 occurrences" of these unexplained terms, which "play a part in the daily commerce of the published language."[22]

This technical approach to deciding what children need to know in order to join the literate speech community is, of course, just one strategy for identifying the content we need to teach in the early grades. It does not include our ethical, civic, and aesthetic aspirations for education, nor topics that are of particular interest in some places but not others. But this technical approach is a big start. It is remarkable how much of the early curriculum in America can be built by simply asking the question, "Is this information often taken for granted in talk and writing addressed to a general literate audience?" As my colleagues at the Core Knowledge Foundation have shown, a very rich and interesting early education can be based on this principle. Striking examples of success from applying this approach can be found—disadvantaged students gaining ground, and all students gaining high literacy. (See "Engaging Kids with Content: 'The Kids Love It'" in the Spring 2006 issue of *American Educator*.)

IV. Maximizing Reading Comprehension, Especially Among Poor Children

Time is of the essence. Because of the Matthew effect, the greatest opportunities for enhancing language comprehension come early; once wasted, they may be lost permanently. What are the best ways to use school time productively so that we bring students from all social backgrounds to proficiency in reading and writing? How can we impart the most enabling language and knowledge as quickly as possible? Most reading activities that teachers and parents engage in with young children have been shown by research to be beneficial. But research rarely asks or answers a crucial question—what is the opportunity cost of engaging in this reading activity rather than that one?

"Opportunity cost" is an important concept from economics that reflects the fact that we forgo some benefits whenever we engage in one activity rather than another.

If we read the same story three times to a child, we need to ask, how great are the benefits that the child will accrue by repetition compared to the benefits of using that valuable time in more productive activities, such as reading other stories on the same topic? If we ask students to repeatedly endure lessons and exercises on "main idea" and "prediction" and "inferencing" instead of using that time to familiarize them with important content, are we using the time as well as we could? The principle of opportunity cost in reading instruction has become even more important now that longer periods—as much as two and one-

half hours in New York City and California and at least 90 minutes virtually everywhere—are being devoted to language arts in the early grades. This means that language arts are getting time that in the past may have been allotted to history, science, and the arts. Yet those neglected subjects are ultimately among the most essential ones for imparting the general knowledge that underlies reading comprehension.

Bring Content to Reading Instruction

A great opportunity is being lost when an efficient and coherent approach to the knowledge required for reading is neglected in the very place where it is most needed—namely, in the long hours devoted to the subject of reading. Decoding experts suggest that for most children, about 30 minutes per day is necessary to teach decoding in grades 1 and 2 (more and with greater intensity for struggling students).[23] Where schools spend 90–120 minutes per day on reading throughout the elementary grades, that leaves at least an hour per day that could be devoted to imparting the language and world knowledge that is most important for competence in listening, talking, reading, and writing. Substantive topics in literature, history, the arts, and the sciences—all of which literate Americans take for granted—are deeply interesting and highly engaging to children.

For many years, the great reading researcher Jeanne Chall complained that the selections offered in language arts classes did not provide students with the knowledge and language experiences they need for general competence in reading. In the two decades since Chall entered this complaint, little has changed. Regrettably, most early reading materials and programs take such a formalistic view of reading comprehension that they neglect the systematic expansion of children's general knowledge and accompanying vocabulary. The systematic phonics in these programs (which, on the whole, are admirable) are not backed up by a systematic approach to the background knowledge that the children will need for later reading comprehension.[24]

We need to reconceive language arts as a school subject. In trying to make all students proficient readers and writers, there is no avoiding the responsibility of imparting the specific knowledge they will need to understand newspapers, magazines, and serious books directed at the national language community. There is no successful shortcut to teaching and learning this specific knowledge. Those who develop language arts programs at the school level or in publishing houses must understand that the skills they wish to impart are in fact knowledge-drenched and knowledge-constituted. The happy consequence will be reading programs that are much more absorbing, enjoyable, and interesting than the disjointed, banal programs offered to students today.

> Part of the curriculum, perhaps about half, should be reserved for topics of community importance.

Topic Immersion

We know that proficient reading requires an adequate vocabulary. We know that children's vocabularies will get bigger when they hear or read rich material, fiction or nonfiction. But not everyone knows how to answer these questions about time use: What is the most effective way to foster vocabulary gain? Is it better to read a child a short text of a different kind each day, or is it better to stay on a topic that stretches over several days or weeks? As we have seen, important research suggests that children can learn words much faster if we stick to the same topic for several sessions, because word learning occurs much faster—up to four times faster—when the verbal context is familiar.[25]

Suppose, for example, you are reading to 5-year-old Dmitri a story about kings and queens. If you extend that topic for the next few days by reading more fiction and nonfiction stories about kings and queens, how they lived, and what they did, the chances are that Dmitri will increase his general knowledge and vocabulary faster than if you read about zebras the next day, planets the day after that, and so on. Clearly, then, a good way to induce fast vocabulary gain for young children (for whom so much is new and unfamiliar) is to stay on a subject long enough for the general topic to become familiar.

Oral Language Development/ Reading Aloud

The crucial years for gaining a good start in language are the early years.[26] At the youngest ages, 2 through 7, long before children can comprehend through reading as well as they can through listening, progress in language occurs chiefly through listening and talking, not through reading and writing. This reality has rightly resulted in some time being devoted to teacher read-alouds in the early grades. But it's worth considering how we might treat these read-alouds and the conversations they generate differently if we regarded them as absolutely fundamental to imparting necessary knowledge to children. For example, we might consider the effects of topic immersion—reading a sequence of books on a significant topic (over days or weeks) instead of selecting books as standalone texts. We would select books in part for the topics and language they brought to the classroom and for the challenging classroom conversations they sparked. We would consider how to use other classroom activities to engage children in the content of the books.

We need to place a great deal of emphasis in early grades reading classes on nonwritten, oral activities—on adults reading aloud coherent and challenging material, on discussing it, on having children elaborate on these materials. There is every scientific reason to predict that an intensive focus on oral language development during the classroom reading period in early grades will not only raise reading achieve-

ment for all students, it will also help narrow the gap between social groups.

V. Beyond the Reading Class—Imparting Important Knowledge Systematically, from the Earliest Ages

Great strides could be taken with reading comprehension if we simply brought well-considered content into the reading curriculum. But there's no getting around the fact that that's only the beginning. If we really want to impart to students the general knowledge that will allow them to be strong general readers, they, especially if they're not already from print-rich homes, deserve immersion in well-considered content all day long—and from the earliest ages. And, as we will see, for practical reasons, the specifics of the content—and when it will be taught—can't be decided separately by each school, teacher, or district. Not if we really care about whether our students actually learn what they need to learn in order to be strong readers.

Why Educational Effectiveness and Equity Require Students across Schools to Share a Curriculum Core

I'm now looking at one state's guidelines for language arts. (I won't reveal the state, since its request for me to review the document indicates its own dissatisfaction with them.) This state curriculum guide is quite typical. It is a 103-page document organized into a dozen broad categories, all of which apply to all grades from kindergarten through grade 12. The general categories have process rubrics like "Students shall demonstrate knowledge and understanding of media as a mode of communication," "Students shall employ a wide range of strategies as they write, using the writing process appropriately," and "Students shall apply a wide range of strategies to read and comprehend written materials." Then, in the more "detailed" amplifications of these categories for the early grades, we find directives like, "Distinguish the purpose of various types of media presentations, using informational or entertainment presentations," "Use a variety of planning strategies/organizers," and "Draft information collected during reading and/or research into writing." For later grades, the detailed amplifications are directives like, "Write research reports that include a thesis and use a variety of sources" and "Read a variety of literature, including historical fiction, autobiography, and realistic fiction."

These are empty admonitions. And they constitute the first major shortcoming of these process-oriented, formalistic guidelines—they offer no real guidance. In offering no guidance, they guarantee an incoherent education with huge gaps and boring repetitions. Elementary school students reasonably complain of reading *Charlotte's Web* three years in a row. That's not too surprising. With guidelines like these, why should Mr. Green in grade three, Ms. Jones in grade four, and Ms. Hughes in grade five not treat their students to a book they are very fond of? Of course, while students are reading that estimable work three years running (being bored in two of them), they are missing at least two other estimable books they might have been introduced to.

This kind of problem is not limited to language arts. I once did an analysis of a district science curriculum which, like most American curricula, had a hands-on, formalistic, process orientation and found that students did a hands-on study of seeds in four different grades but were never required to learn about photosynthesis at all.[27] Gaps and repetitions are the reality of American students' school experience even when they stay in the same school—and the gaps are far greater for those many disadvantaged students who must change schools. (See "Why the Absence of a Content-Rich Curriculum Core Hurts Poor Children Most" in the Spring 2006 issue of *American Educator*.) These gaps and repetitions occur unwittingly, not through the recklessness of guideline makers nor the incompetence of teachers, but thanks to the formalistic idea that no particular piece of knowledge will boost reading comprehension more than any other. It is true that some of the new state standards can point to increasingly specific guidance in a few areas, but these are the exceptions. In general, the de facto curriculum in the American school is defined by the textbooks that are used and by the selections within them that are made according to the tastes and beliefs of individual teachers. In other words, the curriculum in most American classrooms is an unknown curriculum, one that assures incoherence from grade to grade and school to school.

Coherence and commonality of curriculum, gained through specifying core content, has decisive educational advantages over our vague, laissez faire curriculum arrangements. Of course, by "commonality of content," I do not mean a

100 percent common curriculum across the nation under which each child in each early grade follows exactly the same course of study. I mean rather a more reasonable percentage of common content, such as Thomas Jefferson and Horace Mann had in view—say, between 40 and 60 percent of the topics that young children are taught.

In addition, to reduce the negative impact of massive student mobility, we must reach agreement not only about what subject matter should be taught in school, but also about the grade level at which that agreed-upon subject matter should be taught. Just as we have created a convention about the standard spelling of *Mississippi*, we need to create a convention about the grade level at which school topics shall be introduced. If we agree that primary-grade children should be taught about the lives of George Washington and Martin Luther King, Jr., then we have an obligation to decide when these topics will be introduced. The ravages of mobility on disadvantaged students ought to exert a powerful moral claim in favor of such a policy, which deserves to trump local sentiments about whether kindergarten is or is not the right place for Washington or King. No one can really answer that ques-

tion in absolute terms. In most cases, questions about proper grade level have no absolute right answer, because, as Jerome Bruner famously observed, almost any topic, if taught appropriately, can be taught at any school age.[28]

But Bruner's insight emphatically does not argue for laissez faire regarding the sequencing of topics. On the contrary, using an automotive analogy, either side of the road, appropriately demarcated, is suitable for driving in either direction—which is precisely why it is necessary to create a convention for determining whether the right side or the left side will be used. Whichever side of the road a state decides on, that same convention needs to hold for all roads in all the states, because cars cross state lines every day—just as disadvantaged students move across schools (and districts and even states) every day. The consequence of not creating a convention about the sequencing of agreed-upon topics is that some highly mobile students will never read *Charlotte's Web* or Langston Hughes, while others will hear about them endlessly, in kindergarten, grade one, grade two, and beyond.

Why Equity Requires Knowledge-Rich Preschool for Children from Low-Income Homes

Research from many quarters argues that the sooner children can be exposed to and engaged with words, knowledge, language, and language conventions, the better off they'll be. The reason for this is clear: because the powerful Matthew effect will be working for them, not against them. That this is especially true for children from the poorest, least language-rich homes should be obvious.

When children are offered coherent, cumulative knowledge from preschool on, reading proficiency is the result. The fullest evidence for the validity of this prediction comes from large-scale studies conducted by French researchers on the effects of very early knowledge instruction in school on later reading achievement.[29] The French are in a good position to perform such studies. They have been running state-sponsored preschools for more than a hundred years. By age 5, almost 100 percent of French children, including the children of immigrants from Africa, Asia, and southern Europe, attend preschools. At age 4, 85 percent of all children attend, and astonishingly, at age 2, 30 percent of all children attend. Analyses of records from tens of thousands of students—records that include detailed information about race, ethnicity, and social class—show that the earlier the child starts, the greater the positive effect on reading will be. By the end of fifth grade in France, the relative benefit to disadvantaged pupils who start at the amazingly early age of 2 rather than 4 is over one-half of a standard deviation, quite a large effect size. (In terms of percentile scores, it's like moving a student up from the 16th to the 31st percentile or from the 50th to the 69th percentile.) Those who start at age 3 do better in later reading than those who start at age 4, and starting school at age 4 is better than starting at age 5. These studies show that the long-term gain in starting early is greater for disadvantaged than for advantaged students.

Effective use of school time is especially important in all areas of learning connected with the advancement of language comprehension, which is inherently a slow process. For children who grow up in highly articulate homes where they hear a wealth of language every day, the need to use time effectively to enlarge language comprehension is not as critical as it is for children who grow up in language-barren circumstances. For those growing up in such homes, schools themselves should become highly effective and efficient imparters of language in all its aspects: vocabulary, syntax, knowledge, etc. If we can do that, greater reading comprehension, higher school achievement, and greater equity will be the result.

When James Coleman, the great sociologist of education, analyzed the school characteristics that had the greatest impact on educational achievement and equity, he found that schools with greater academic intensity—a persistent, goal-directed focus on academics—produced not only greater learning, but also narrowed the achievement gap between ethnic groups.[30] That such academically focused schools would raise general achievement is obvious since an intense focus on academics is self-evidently the most likely means to raise academic achievement. The finding on narrowing the achievement gap is more interesting, and it has positive implications for both advantaged and disadvantaged students.

The early curriculum can be built by asking, "Is this information often taken for granted?"

The theoretical explanation for Coleman's finding about equity is this: When students learn more in school during the course of a classroom period and during an entire year, disadvantaged students begin to catch up, even when their advantaged peers are learning more or less the same things they are. That is because disadvantaged students start out knowing less, so each additional bit of learning is proportionally more enabling to them than to students who already knew more. If we are reading a story about Johnny Appleseed and some students know how plants grow while others don't, the latter group, the botanically challenged students, will be the ones who learn most from the story (assuming they know at least 90 percent of the words), although both groups will learn something new about Johnny Appleseed.

And there is a further reason for the equity effect that Coleman observed. When a lot of learning is going on in school, the proportion of the academic knowledge gained in school increases and the proportion gained outside school decreases. When students are learning many academic things in the classroom, that will narrow the academic gap because disadvantaged students are more dependent on schools for gaining academic information than advantaged students. Advantaged students have a chance to learn a lot of academically relevant things from their homes and peer groups, whereas disad-

vantaged students learn academically relevant things mostly from their schools. Boosting the in-school proportion thus reduces the impact of the unfair distribution of out-of-school learning opportunities.

There is another point to be made here. A school that enrolls a heavily middle-class population faces a far lower hurdle in getting its children to reach high reading levels than does a counterpart school enrolling a heavily low-income population. The first school enrolls students who typically entered school ahead in their background knowledge and vocabulary and will have substantial access to knowledge and vocabulary in their non-school lives, as well (whether from summer camp, vacation trips, educated parents and relatives, museum visits, etc.). The counterpart school, with a heavily low-income student population, typically enrolls children who entered kindergarten already behind and have fewer opportunities to gain this knowledge and vocabulary outside school. In comparison to the first school, the low-income school's task of bringing its students to proficient reading comprehension levels is enormous. Schools that enroll many poor children can't be merely effective; to bring their students to proficient reading levels, they need to be supereffective. They need an extraordinary level of help, support, and good ideas to meet the challenges they face. I believe that the ideas put forward here can help these schools be supereffective, as their students, and the nation, need them to be. □

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How Knowledge Helps

It Speeds and Strengthens Reading Comprehension, Learning—and Thinking

By Daniel T. Willingham

"Knowledge is Good." So read the motto of the mythical Faber College in the 1978 movie, Animal House. Those of us who work in education would agree, even if we were unable to express ourselves so eloquently. But why, exactly, is knowledge good? When I've discussed this question with teachers, many have used the metaphor "It's grist for the mill." That is, the goal of education is seen not so much as the accumulation of knowledge, but as the honing of cognitive skills such as thinking critically. Knowledge comes into play mainly because if we want our students to learn how to think critically, they must have something to think about.

It's true that knowledge gives students something to think about, but a reading of the research literature from cognitive science shows that knowledge does much more than just help students hone their thinking skills: It actually makes learning easier. Knowledge is not only cumulative, it grows exponentially. Those with a rich base of factual knowledge find it easier to learn more—the rich get richer. In addition, factual knowledge enhances cognitive processes like problem solving and reasoning. The richer the knowledge base, the more smoothly and effectively these cognitive processes—the very ones that teachers target—operate. So, the more knowledge students accumulate, the smarter they become. We'll begin by exploring how knowledge brings more knowledge and then turn to how knowledge improves the quality and speed of thinking.

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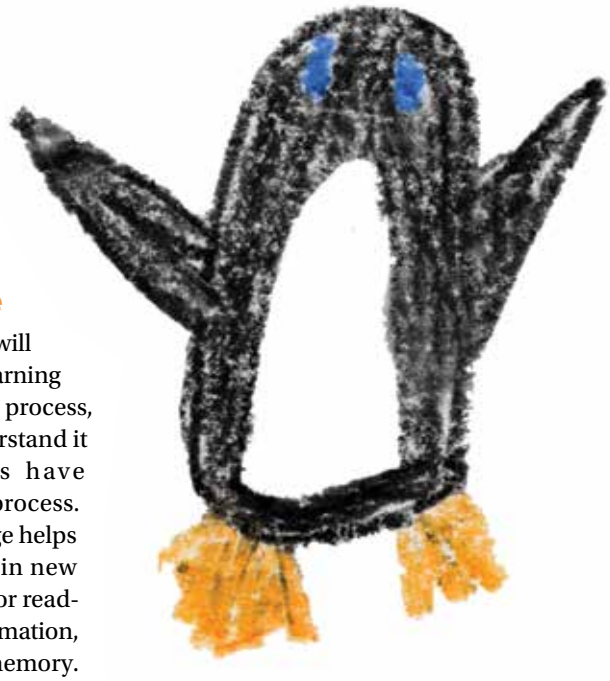
I. How Knowledge Brings More Knowledge

The more you know, the easier it will be for you to learn new things. Learning new things is actually a seamless process, but in order to study it and understand it better, cognitive scientists have approached it as a three-stage process. And they've found that knowledge helps at every stage: as you first take in new information (either via listening or reading), as you think about this information, and as the material is stored in memory. We'll consider each of these stages in turn.

How Knowledge Helps You Take in New Information

The first stage in which factual knowledge gives you a cognitive edge is when you are taking in new information, whether by listening or reading. There is much more to comprehending oral or written language than knowing vocabulary and syntax. Comprehension demands background knowledge because language is full of semantic breaks in which knowledge is assumed and, therefore, comprehension depends on making correct inferences. In a casual conversation, the listener can gather missing background knowledge and check on his inferences by asking questions (e.g., Did you mean Bob Smith or Bob Jones? What do you mean when you describe him as an entrepreneur?)—but this is not the case when watching a movie or reading a book. (And sometimes it isn't the case in class when a student is too embarrassed to ask a question.)

To provide some concrete examples and simplify the discussion, let's focus on



reading—but keep in mind that the same points apply to listening. Suppose you read this brief text: "John's face fell as he looked down at his protruding belly. The invitation specified 'black tie' and he hadn't worn his tux since his own wedding, 20 years earlier." You will likely infer that John is concerned that his tuxedo won't fit, although the text says nothing directly about this potential problem. The writer could add the specifics ("John had gained weight since he last wore his tuxedo, and worried that it would not fit"), but they are not necessary and the added words would make the text dull. Your mind is well able to fill in the gaps because you know that people are often heavier 20 years after their wedding, and that gaining weight usually means that old clothing won't fit. This background knowledge about the world is readily available and so the writer need not specify it.

Thus, an obvious way in which knowledge aids the acquisition of more knowledge lies in the greater power it affords in making correct inferences. If the writer assumes that you have some background

knowledge that you lack, you'll be confused. For example, if you read, "He was a real Benedict Arnold about it" and you don't know who Benedict Arnold was, you're lost. This implication of background knowledge is straightforward and easy to grasp. It is no surprise, then, that the ability to read a text and make sense of it is highly correlated with background knowledge.[1] If you know more, you're a better reader.

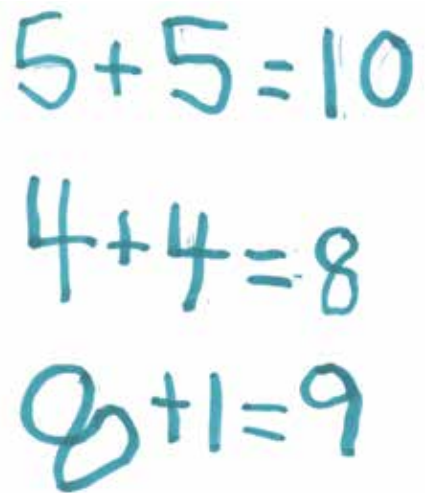
Most of the time you are unaware of making inferences when you read. For example, when you read the text above it's unlikely you thought to yourself, "Hmmm ... let me see now ... why am I being told about the last time he wore his tuxedo? Why would thinking about that make his face fall?" Those conscious inferences are unnecessary because the cognitive processes that interpret what you read automatically access not just the literal words that you read, but also ideas associated with those words. Thus, when you read "tux," the cognitive processes that are making sense of the text can access not just "a formal suit of clothing," but all of the related concepts in your memory: Tuxedos are expensive, they are worn infrequently, they are not comfortable, they can be rented, they are often worn at weddings, and so on. As the text illustrates, the cognitive processes that extract meaning also have access to concepts represented by the intersection of ideas; "tux" makes available "clothing," and "20 years after wedding" makes available "gaining weight." The intersection of "clothing" and "gaining weight" yields the idea "clothing won't fit" and we understand why John is not happy. All of these associations and inferences happen outside of awareness. Only the outcome of this cognitive process—that John is concerned his tux won't fit anymore—enters consciousness.

Sometimes this subconscious inference-making process fails and the ideas in the text cannot be connected. When this happens, processing stops and a greater effort is made to find some connection among the words and ideas in the text. This greater effort requires conscious processing. For example, suppose that later in the same text you read, "John walked down the steps with care. Jeanine looked him up and down while she waited. Finally she said, 'Well, I'm glad I've got some fish in my purse.'" Jeanine's comment might well stop the normal flow of reading. Why would she have fish? You would search for some relationship between carrying fish to a formal event and the other elements of the situation (formal wear, stairs, purses, what you've been told of Jeanine and John). In this search you might retrieve the popular notion that wearing a tuxedo can make one look a little like a penguin, which immediately leads to the association that penguins eat fish. Jeanine is likening John to a penguin and thus she is teasing him. Sense is made, and reading can continue. Here, then, is a second and more subtle benefit of general knowledge: People with more general knowledge have richer associations among the concepts in memory; and when associations are strong, they become available to the reading process automatically. That means the person with rich general knowledge rarely has to interrupt reading in order to consciously search for connections.

This phenomenon has been verified experimentally by having subjects read texts on topics with which they are or are not very familiar. For example, Johanna Kaakinen and her colleagues had subjects read a text about four common diseases (e.g., flu) for which they were likely already familiar with the symptoms, and a text about four uncommon diseases (e.g., typhus) for which they likely were not.[2] For each text, there was additional information about the diseases that subjects likely did not know.

The researchers used a sophisticated technology to unobtrusively measure where subjects fixated their eyes while they read each text. Researchers thus had a precise measure of reading speed, and they could tell when subjects returned to an earlier portion of the text to reread something. The researchers found that when reading unfamiliar texts, subjects more often reread parts of sentences and they more often looked back to previous sentences. Their reading speed was also slower overall compared to when they read familiar texts. These measures indicate that processing is slower when reading about something unfamiliar to you.

Thus, background knowledge makes one a better reader in two ways. First, it means that there is a greater probability that you will have the knowledge to successfully make the necessary inferences to understand a text (e.g., you will know that people are often heavier 20 years after their wedding and, thus, John is worried that his tux won't fit). Second, rich background knowledge means that you will rarely need to reread a text in an effort to consciously search for connections in the text (e.g., you will quickly realize that with her fish remark, Jeanine is likening John to a penguin).



How Knowledge Helps You Think about New Information

Comprehending a text so as to take in new information is just the first stage of learning that new information; the second is to think about it. This happens in what cognitive scientists call working memory, the staging ground for thought. Working memory is often referred to metaphorically as a space to emphasize its limited nature; one can maintain only a limited amount of information in working memory. For example, read through this list one time, then look away and see how many of the letters you can recall.

CN

NFB

ICB

SCI

ANC

AA

There were 16 letters on the list, and most people can recall around seven—there is not sufficient space in working memory to maintain more than that. Now try the same task again with this list.

CNN

FBI

CBS

CIA

NCAA

Much easier, right? If you compare the two lists, you will see that they actually

contain the same letters. The second list has been reorganized in a way that encourages you to treat C, N, and N as a single unit, rather than as three separate letters. Putting items together this way is called chunking. It greatly expands how much fits in your working memory—and, therefore, how much you can think about. The typical persons' working memory can hold about seven letters or almost the same number of multi-letter chunks or pieces of information. Note, however, that chunking depends on background knowledge. If you weren't familiar with the abbreviation for the Federal Bureau of Investigation, you couldn't treat FBI as a single chunk.

The ability to chunk and its reliance on background knowledge has been tested in a number of studies. These studies show that this ability makes people better able to briefly remember a list of items, just as you could remember more letters in the second example. This benefit has been observed in many domains, including chess,[3] bridge,[4] computer programming,[5] dance steps,[6] circuit design,[7] maps,[8] and music.[9]

Of course, we seldom want to briefly remember a list. The important aspect of chunking is that it leaves more free space in working memory, allowing that space to be devoted to other tasks, such as recognizing patterns in the material. For example, in one study, the researchers tested junior high school students who were either good or poor readers (as measured by a standard reading test) and who were also knowledgeable or not about the game of baseball (as measured by a test created for the study by three semi-professional baseball players).[10] The children read a passage written at an early 5th-grade reading level that described a half inning of a baseball game. The passage was divided into five parts, and after each part the student was asked to use a replica of a baseball field and players to reenact and describe what they read. The researchers found that baseball knowledge had a big impact on performance: Poor readers with a high knowledge of baseball displayed better comprehension than good readers with a low knowledge of baseball.

What's going on here? First, the students with a lot of knowledge of baseball were able to read a series of actions and chunk them. (For example, if some of the text described the shortstop throwing the ball to the second baseman and the second baseman throwing the ball to the first baseman resulting in two runners being out, the students with baseball knowledge would chunk those actions by recognizing them as a double play—but the students without baseball knowledge would have to try to remember the whole series of actions.) Second, because they were able to chunk, the students with baseball knowledge had free space in their working memory that they could devote to using the replica to reenact the play as well as providing a coherent verbal explanation. Without being able to chunk, the students with little baseball knowledge simply didn't have enough free space in their working memory to simultaneously remember all of the actions, keep track of their order, do the reenactment, and describe the reenactment.

> All of these associations and inferences happen outside of awareness. Only the outcome of this cognitive process enters consciousness.

This study illustrates the importance of the working memory advantage that background knowledge confers.[11] Most of the time when we are listening or reading, it's not enough to understand each sentence on its own—we need to understand a series of sentences or paragraphs and hold them in mind simultaneously so that they can be integrated or compared. Doing so is easier if the material can be chunked because it will occupy less of the limited space in working memory. But, chunking relies on background knowledge.

How Knowledge Helps You Remember New Information

Knowledge also helps when you arrive at the final stage of learning new information—remembering it. Simply put, it is easier to fix new material in your memory when you already have some knowledge of the topic.[12] Many studies in this area have subjects with either high or low amounts of knowledge on a particular topic read new material and then take a test on it some time later; inevitably those with prior knowledge remember more.

A study by David Hambrick is notable because it looked at real-world learning and did so over a longer period of time than is typical in such studies.[13] First, Hambrick tested college students for their knowledge of basketball. This test took place in the middle of the college basketball season. Two and one-half months later (at the end of the season), subjects completed questionnaires about their exposure to basketball (e.g., game attendance, watching television, and reading magazines or newspapers) and also took tests that measured their knowledge of specific men's basketball events from the prior two and one-half months. The results showed (not surprisingly) that subjects who reported an interest in the game also reported that they had had greater exposure to basketball information. The more interesting finding was that, for a given level of exposure, greater prior basketball knowledge was associated with more new basketball knowledge. That is, the people who already knew a lot about basketball tended to remember more basketball-related news than people with the same exposure to this news but less prior knowledge.* As I said in the introduction, the rich get richer.

What's behind this effect? A rich network of associations makes memory strong: New material is more likely to be remembered if it is related to what is already in memory. Remembering information on a brand new topic is difficult because there is no existing network in your memory that the new information can be tied to. But remembering new information on a familiar topic is relatively easy because developing associations between your existing network and the new material is easy.

* * *

Some researchers have suggested that prior knowledge is so important to memory that it can actually make up for or replace what we normally think of as aptitude. Some studies have administered the same memory task to high-aptitude and low-aptitude children, some of whom have prior knowledge of the subject matter and some of whom do not; the studies found that only

prior knowledge is important.[14] But some researchers disagree. They report that, although prior knowledge always helps memory, it cannot eliminate the aptitude differences among people. Since everyone's memory gets better with prior knowledge, assuming equal exposure to new knowledge (as in a classroom without extra support for slower students), the student with overall lower aptitude will still be behind the student with higher aptitude.[15] In the end, the issue is not settled, but as a practical matter of schooling, it doesn't matter much. What matters is the central, undisputed finding: All students will learn more if they have greater background knowledge.

II. How Knowledge Improves Thinking

Knowledge enhances thinking in two ways. First, it helps you solve problems by freeing up space in your working memory. Second, it helps you circumvent thinking by acting as a ready supply of things you've already thought about (e.g., if you've memorized that 5 + 5 = 10, you don't have to draw two groups of five lines and count them). To simplify the discussion, I'll focus mostly on research that explores the benefits of knowledge for problem solving, which is essentially the type of thinking that students must do in mathematics and science classes. But keep in mind that in much the same way, knowledge also improves the reasoning and critical thinking that students must do in history, literature, and other humanities classes.

How Knowledge Helps You Solve Problems

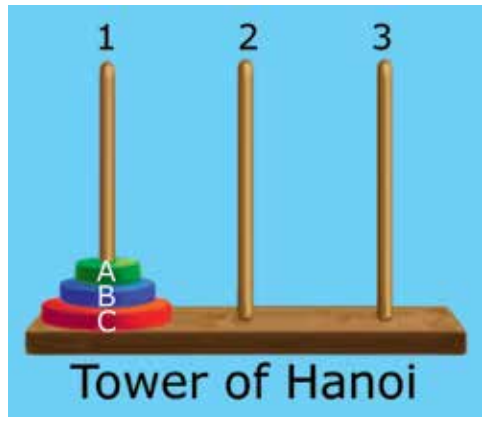
In the last section, I discussed one way that prior knowledge helps reading: It allows you to chunk some information, which leaves more room in working memory to sort through the implications of a text. You get much the same benefit if you are trying to solve a problem. If you don't have sufficient background knowledge, simply understanding the problem can consume most of your working memory, leaving no space for you to consider solutions. I can give you a sense of this impact with a sample problem called the Tower of Hanoi. The picture shows three pegs with three rings of increasing size. The goal is to move all the rings to the rightmost peg. There are just two rules: You can only move one ring at a time, and you can't put a larger ring on top of a smaller ring. See if you can solve the problem.

With some diligence, you may well be able to solve the problem. The solution is to move the rings as follows: A3, B2, A2, C3, A1, B3, A3.

Now consider this problem:

> In the inns of certain Himalayan villages is practiced a refined tea ceremony. The ceremony involves a host and exactly two guests, neither more nor less. When his guests have arrived and seated themselves at his table, the host performs three services for them. These services are listed in the order of the nobility the Himalayans attribute to them: stoking the fire, fanning the flames, and pouring the tea. During the ceremony, any of those present may ask another, "Honored Sir, may I perform this onerous task for you?" However, a person may request of another only the least noble of the tasks that the other is performing. Furthermore, if a person is performing any tasks, then he may not request a task that is nobler than the least noble task he is already performing. Custom requires that by the time the tea ceremony is over, all the tasks will have been transferred from the host to the most senior of the guests. How can this be accomplished?

You would probably have to read the problem several times just to feel that you understand it—but this problem is actually identical to the Tower of Hanoi. Each guest is like a peg, and each task is like a ring. The goal and the rules of transfer are the same. The difference is that this version is much more demanding of working memory. The first version does not require you to maintain the problem in working memory because it is so effectively represented in the figure. The second version requires that the solver remember the order of nobility of the tasks, whereas in the first version you



can easily chunk the order of ring size—smallest to largest.

These two problems give you a sense of the advantages of background knowledge for problem solving. The problem solver with background knowledge in a particular domain sees problems in her domain like the Tower of Hanoi; everything is simple and easy to understand. When she is outside her domain, however, the same problem solver cannot rely on background knowledge and problems seem more like the confusing tea ceremony. It's all she can do to simply understand the rules and the goal.

These examples put the "grist for the mill" metaphor in a new light: It's not sufficient for you to have some facts for the analytic cognitive processes to operate on. There must be lots of facts and you must know them well. The student must have sufficient background knowledge to recognize familiar patterns—that is, to chunk—in order to be a good analytical thinker. Consider, for example, the plight of the algebra student who has not mastered the distributive property. Every time he faces a problem with a(b + c), he must stop and plug in easy numbers to figure out whether he should write a(b) + c or a + b(c) or a(b) + a(c). The best possible outcome is that he will eventually finish the problem—but he will have taken much longer than the students who know the distributive property well (and, therefore, have chunked it as just one step in solving the problem). The more likely outcome is that his working memory will become overwhelmed and he either won't finish the problem or he'll get it wrong.

How Knowledge Helps You Circumvent Thinking

It's not just facts that reside in memory; solutions to problems, complex ideas you've teased apart, and conclusions you've drawn are also part of your store of

*Careful readers may notice that in this study there is some possibility that the college students' interest in basketball (not just their knowledge) could have some effect on their memory of basketball events. A more complicated study controlled for interest by creating experts. Subjects were brought in to pre-learn some information (which then served as their background knowledge) and then return two days later to learn additional knowledge. The researchers still found a memory boost from background knowledge.[20]

knowledge. Let's go back to the algebra students for a moment. The student who does not have the distributive property firmly in memory must think it through every time he encounters a(b + c), but the student who does, circumvents this process. Your cognitive system would indeed be poor if this were not possible; it is much faster and less demanding to recall an answer than it is to solve the problem again. The challenge, of course, is that you don't always see the same problem, and you may not recognize that a new problem is analogous to one you've seen before. For example, you may have successfully solved the Tower of Hanoi problem and moments later not realized that the tea ceremony problem is analogous.

Fortunately, knowledge also helps with this: A considerable body of research shows that people get better at drawing analogies as they gain experience in a domain. Whereas novices focus on the surface features of a problem, those with more knowledge focus on the underlying structure of a problem. For example, in a classic experiment Michelene Chi and her colleagues asked physics novices and experts to sort physics problems into categories.[16] The novices sorted by the surface features of a problem—whether the problem described springs, an inclined plane, and so on. The experts, however, sorted the problems based on the physical law needed to solve it (e.g., conservation of energy). Experts don't just know more than novices—they actually see problems differently. For many problems, the expert does not need to reason, but rather, can rely on memory of prior solutions.

Indeed, in some domains, knowledge is much more important than reasoning or problem-solving abilities. For example, most of the differences among top chess players appear to be in how many game positions they know, rather than in how effective they are in searching for a good move. It seems that there are two processes to selecting a move in chess. First, there is a recognition process by which a player sees which part of the board is contested, which pieces are in a strong or weak position, and so forth. The second process is one of reasoning. The player considers possible moves and their likely outcome. The recognition process is very fast, and it identifies which pieces the slower reasoning process should focus on. But the reasoning process is very slow as the player consciously considers each possible move. Interestingly, a recent study indicates that the recognition process accounts for most of the differences among top players.[17] Burns compared the performance of top players at normal and blitz tournaments. In blitz chess, each player has just five minutes to complete an entire game, whereas in a normal tournament, players would have at least two hours. Even though play was so sped up that the slow reasoning processes barely had any time to contribute to performance, the relative ratings of the players were almost unchanged. That indicates that what's making some players better than others is differences in their fast recognition processes, not differences in their slow reasoning processes. This finding is rather striking. Chess, the prototypical game of thinking and reflection, turns out to be largely a game of memory among those who are very skilled. Some researchers estimate that the best chess players have between 10,000 and 300,000 chess-piece chunks in memory.[18]

Burns's study of chess skill meshes well with studies of science education. A recent meta-analysis evaluated the results of 40 experiments that studied ways to improve students' scientific problem-solving skills.[19] The results showed that the successful interventions were those that were designed to improve students' knowledge base. Especially effective were those in which students were asked to integrate and relate different concepts by, for example, drawing a concept map or comparing different problems. Interventions designed to improve the students' scientific problem-solving strategies had little or no impact, even though the goal of all the studies was to improve scientific problem solving.

We've seen how knowledge improves learning and thinking. But what does this mean for the classroom? My sidebar "Knowledge in the Classroom" in the Spring 2006 issue of *American Educator* offers some strategies for building students' store of knowledge. □

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Teaching Vocabulary

Early, Direct, and Sequential

By Andrew Biemiller

I have come to the conclusion that vocabulary growth is inadequately addressed in current educational curricula, especially in the elementary and preschool years, and that more teacher-centered and planned curricula are needed, just as had been the case with phonics. My late friend Jeanne Chall came to the same conclusion through her work on the stages of reading development,[1] her work on textbook difficulty,[2] and especially as summarized in *The Reading Crisis*.[3] In this book, Chall and her colleagues traced the relative reading achievement declines experienced by working-class children who had become competent readers by third grade, but whose vocabulary limitations had an increasingly negative effect on reading comprehension as they advanced to seventh grade.

The importance of vocabulary first came to my attention as a result of Wesley Becker's famous *Harvard Educational Review* article,[4] noting that DISTAR's early success with decoding was muted for reading comprehension in the later elementary grades due to vocabulary limitations. Becker argued that this was a matter of experience rather than general intelligence, observing that while his DISTAR students' reading comprehension declined relative to more advantaged students by grade 4, their mathematics performance remained high. He suggested that the difference was that all the knowledge that is needed for math achievement is taught in school, whereas the vocabulary growth needed for successful reading comprehension is essentially left to the home.

I have also been influenced by the consistent finding in the oral reading miscue literature that, when overall error rates reach 5 percent of running words (tokens), "contextual" errors (those that make sense in context) virtually disappear. I infer from this that when readers (or listeners?) understand less than 95 percent of the words in a text, they are likely to lose the meaning of that text and are especially unlikely to infer meanings of unfamiliar words.

Vocabulary development is both important and ignored. Can we—educators—do better, or are we simply bumping into constitutional limitations that are beyond the power of schools to affect? In the remainder of this article, I am going to summarize a few points that support the argument for an increased emphasis on vocabulary and suggest the need for a more teacher-centered and curriculum-structured approach to ensure adequate vocabulary development.

The consequences of an increased emphasis on phonics. In recent years, we have seen a tremendous emphasis on the importance of phonics instruction to ensure educational progress. We also have seen that while more children learn to "read" with increased phonics instruction, there have not been commensurate gains in reading comprehension.[5] What is missing for many children who master phonics but don't comprehend well is vocabulary—the words they need to know in order to understand what they're reading. Thus vocabulary is the "missing link" in reading/language instruction in our school system. Because vocabulary deficits particularly affect less advantaged and second-language children, I will be arguing that such "deficits" are fundamentally more remediable than many other school learning problems.

Schools now do little to promote vocabulary development, particularly in the crucial years before grade 3. The role of schooling in vocabulary acquisition has been the subject of much debate. Early (pre-literacy) differences in vocabulary growth are associated with social class.[6]

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Nagy and Herman[7] and Sternberg[8] argue that much vocabulary acquisition results from literacy and wide reading rather than from direct instruction. However, it is obvious that a great deal of vocabulary acquisition occurs before children become literate, and before they are reading books that introduce unfamiliar vocabulary.[9] Cantalini[10] and Morrison, Smith, and Dow-Ehrensberger[11] report that vocabulary acquisition in kindergarten and grade 1 is little influenced by school experience, based on the finding that the youngest first-graders have about the same vocabulary (Peabody Picture Vocabulary Test) as the oldest kindergarten children. Cantalini also reported the same result for second grade.

The relatively small number of words that need to be learned. It is sometimes argued that the number of words children need to learn is so great that this can only happen incidentally through wide reading.[12] This argument is quite reminiscent of the argument that the spelling-to-sound structure of English is so difficult that it can't be taught, but only learned through experience. In both cases, the complexity of what needs to be learned has been somewhat exaggerated. Many years ago, Lorge and Chall[13] argued that traditional dictionary sampling methods for assessing vocabulary had greatly overestimated the volume of vocabulary children needed to acquire. As Lorge and Chall, Beck and McKeown,[14] and others have noted, we need to focus on root-word growth rather than the acquisition of all inflected and derived forms of words. (Another term for *root* words is *base* words.) Examples of root words include *door*, *rock* (a big stone), *rock* (move—as with a cradle), *bible* (an authoritative book) or *tall*. Words with affixes are not additional *root* words. Examples include *doors, rocks, rocking, bibles, taller*.

Jeremy Anglin's monograph suggests that children acquire about 1,200 root words a year during the elementary years, with perhaps half that many root words learned per year prior to grade 1.[15] (He also argues that perhaps twice that many words need to be learned, particularly including idiomatic forms.) My own research suggests that the average number of root-word meanings acquired per year may be somewhat smaller, more like 1,000 root-word meanings per year from early infancy to the end of elementary school.[16] (An average total of around 3,000 root-word meanings are learned before kindergarten.) This conclusion, based on root-word meanings sampled from Dale and O'Rourke's *Living Word Vocabulary*,[17] is partly based on the observation that many similar or affixed meanings are acquired at about the same age and probably do not require separate instruction.

Evidence that vocabulary differences present by grade 2 may account for most vocabulary differences in elementary school. There has been relatively little discussion or examination of individual differences in vocabulary growth. Hart and Risley observed large differences associated with word learning opportunities in the toddler and preschool years.[18] I have also found that large vocabulary differences are present by the end of grade 2—amounting to a difference of more than 4,000 root words between the highest and lowest quartiles in a normative population.[19] By grade 4, the lowest quartile had only reached the average for grade 2 children. Thus, if we could find ways of supporting more rapid vocabulary growth in the early years, more children would be able to comprehend "grade-level" texts in the upper elementary grades. Note that the "reading grade level" of texts is in fact almost entirely determined by the vocabulary load of those texts.[20] Thus early vocabulary limitations make "catching up" difficult, even though once in school children appear to acquire new vocabulary at similar rates. To "catch up," vocabulary-disadvantaged children have to acquire vocabulary at above-average rates. This rarely happens.

The sequential nature of vocabulary acquisition. Much evidence clearly indicates that vocabulary is acquired in largely the same order by most children. The existence of empirical vocabulary norms (as in the Peabody Picture Vocabulary Test and *Living Word Vocabulary*) indicate that some words are acquired later than others. Slonim and I have found very high correlations (mostly over .90) between how well words are known in different grades.[21] We also found that when data are ordered by how many word meanings children know, rather than their grade level, we can clearly identify a range of word meanings known well (above 75 percent), word meanings being acquired (74 percent – 25 percent), and those that are little known. Furthermore, these ranges are sequential. At any given point in vocabulary acquisition, a preliminary conclusion from this work is that there are about 2,000–3,000 root words that a child is likely to be learning. This makes the construction of a "vocabulary curriculum" plausible.

Defining an essential vocabulary for high school graduates. A corollary of the sequential nature of vocabulary acquisition is the possibility of defining a common

vocabulary needed by most high school graduates. Several studies have shown that college entrants need 11,000 to 14,000 root words if they are to complete a 4-year college degree, while college graduates typically have about 17,000 root words.[22] We need further research on the degree to which we can identify these words. It is clear that all do not know the same exact words. But it is equally clear that most possess a substantial common vocabulary plus a further discipline-specific vocabulary.

The hypothesis that most root-word and idiomatic vocabulary learned before and during elementary school results from direct explanation of words. We know relatively little about the processes by which children add words to their vocabularies. Some of the data are negative—evidence that children do not easily acquire words by inference, especially children younger than age 10.[23] In Bus, Van Ijzendoom, and Pellegrini's summary of the effects of reading to children, there is evidence that younger children profit less from simply being "read to."[24] There is also positive evidence that children do readily acquire vocabulary when provided with a little explanation as novel words are encountered in context.[25] Preliminary evidence from directly interviewing children about word acquisition suggests that as late as grade 5, about 70 percent of words that are self-reported to be learned are acquired as a result of direct explanation, either as a result of the child's request or instruction, usually by a teacher.[26] Overall, I believe that before age 10, the evidence supports the conclusion that a substantial majority of new root words are acquired through explanation by others (including explanations in texts) rather than by inference while reading, as has often been argued by Anderson, Nagy and Herman, by Sternberg, and others. For practical purposes, we should be prepared to ensure the availability and use of explanations of word meanings throughout at least the elementary school years.

Although children differ in their opportunities to learn words and the ease with which they learn words, evidence suggests that most can acquire vocabulary at normal rates. There is clear evidence that vocabulary is associated with socioeconomic status—presumably reflecting differences in opportunities.[27] There is also clear evidence relating vocabulary development to various phonological skills or capacities.[28] It is possible that environment and "capacity" interact—that constitutionally more-advantaged children also may be environmentally more advantaged. However, a number of studies summarized in Biemiller,[29] Biemiller and Boote,[30] Stahl,[31] and elsewhere clearly indicate that children can acquire and retain two or three word meanings per day through instruction involving contextualized introduction and explanation of new words. Furthermore, while less-verbally-fluent or lower-vocabulary children and adolescents have been found to benefit little from inferring word meanings,[32] more-direct approaches have been reported to work well with these children (see Biemiller and Boote, Elley, Feitelson, and Whitehurst references cited previously). Overall, I suspect that most children (90 percent plus) can acquire new vocabulary at rates necessary to reach what are now "grade-level" or near grade-level vocabulary in middle elementary school, if given adequate opportunity to use new words and adequate instruction in word meanings.

There is clear evidence that vocabulary is associated with socio-economic status—presumably reflecting differences in opportunities.

The need for planned introduction and explanation of vocabulary plus various tools to help children become more independent in dealing with new vocabulary. I have suggested above the hypothesis that 70 percent or more of the root words learned by grade 6 are learned as a result of direct explanation by parents, peers, teachers, and texts. Those who learn more words almost undoubtedly encounter more words and receive more explanations of word meanings. This is especially true of symbolic or abstract words that are mostly acquired after kindergarten.[33] This suggests that we could do considerably more than we do now to ensure the development of adequate vocabulary through systematic exposure to twenty or more new words per week combined with adequate explanation of these words and opportunities to use them. (I am referring to new meanings, not simply word meanings that are unfamiliar in print.) Present school practices fall far short of this objective in the primary grades. (Though schools may do better in the upper elementary grades.) Other types of vocabulary instruction (e.g., using affixes, word-family approaches, and direct instruction in inferencing) will also be useful, especially in grades 3 and above.

This particular objective raises the possibility of returning to a more basal approach (using controlled and planned vocabulary, especially in the primary grades) as one component of classroom language and reading instruction. If vocabulary acquisition is largely sequential in nature, it would appear possible to identify that sequence and to ensure that children at a given vocabulary level have an opportunity to encounter words they are likely to be learning next, within a context that uses the majority of the words that they have already learned. Some researchers are already beginning to work on this objective (e.g., David Francis in Texas, Barbara Foorman in Florida, Jan Hulstijn in the Netherlands, Margaret McKeown, Isabel Beck, and Amy Crosson in Pittsburgh, William Nagy in Seattle, Judith Scott and Elfrieda Hiebert in Santa Cruz, Catherine Snow and Nonie Lesaux in Cambridge, and Esther Geva and myself in Toronto). Many problems need to be solved. Existing lists of words (e.g., *Living Word Vocabulary*) do not correspond closely enough to observed sequences of word acquisition to be great guides (although they are better than nothing). William Nagy (personal communication) has proposed combining Dale and O'Rourke's data with expert ratings—a very reasonable suggestion.

Given the establishment of plausible vocabulary lists, teachers could relate these lists to vocabulary being introduced in books (short stories, novels, texts,

poems) being studied, be aware of words to introduce or explain (or to query children about if they don't ask!), and be aware of some important words that aren't going to be covered in the established curriculum. These words could be taught directly, or other materials (e.g., stories to be read to class) could be introduced that include them. (Since this article was first published, I have produced *Words Worth Teaching*, a book with potential high-priority vocabulary words[34]).

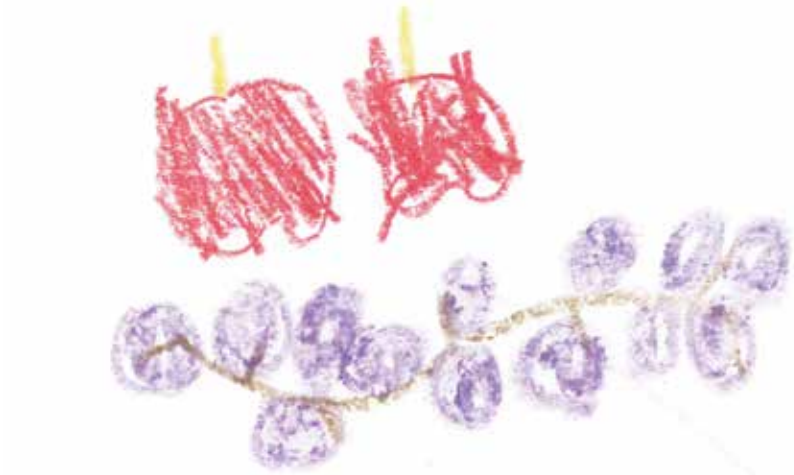
Conclusion: A substantially greater teacher-centered effort is needed to promote vocabulary development, especially in the kindergarten and early primary years. In Jeanne Chall's last book, *The Academic Achievement Challenge*, she presented a summary of research supporting the effectiveness of "teacher centered" approaches to education.[35] The information reviewed here similarly points to the need for a more planned (but contextualized) introduction of vocabulary. This is especially true in the pre-literate years (before grades 3 or 4 when children begin to read books that are likely to introduce new vocabulary). Specifically, increased teacher-centered vocabulary work should include the deliberate introduction of a wider range of vocabulary in the early primary years through oral sources.

This means *reading books aloud* to children. These books should have more advanced vocabulary than the books children in kindergarten and grades 1 or 2 could read to themselves. There may also be videos or other activities that introduce needed vocabulary. One example is PBS's program *Martha Speaks*. In the course of several teacher re-readings of books, teachers should strive to explain 20 or more new word meanings per week.[36] Children should also be encouraged to ask about word meanings they aren't sure of, both during read-alouds and at other times in the classroom. Most children are limited in what they can read at this age level. Teacher read-alouds and vocabulary explanations should ensure coverage of as many as 1,600 high priority root word meanings between kindergarten and grade 2.[37]

In the later elementary years, continued development will include 2,900 priority root words between grades 3 and 6.[38] It should be possible to have students take more responsibility for learning needed word meanings, but teachers should monitor acquisition of at least some of these word meanings. In addition, in the upper elementary grades, instruction is needed in deriving word meanings from affixed words (e.g., *pre*built, work*able*), word families, and idioms, as well as in ways of inferring word meanings. If we are serious about "increasing standards" and bringing a greater proportion of schoolchildren to high levels of academic accomplishment, we cannot continue to leave vocabulary development to parents, chance, and highly motivated reading.

Thus, I strongly recommend a more teacher-directed and curriculum-directed approach to fostering vocabulary and language growth. If education is going to have a serious "compensatory" function, we must do more to promote vocabulary. Our current data show large "environmental" effects in kindergarten to grade 2. Large differences remain by grade 5 (e.g., children in the lowest fifth-grade quartile have vocabularies similar to median second-grade children). Is this simply the product of "intelligence"? I believe it is in considerable part the result of different learning opportunities. After grade 2, vocabulary growth rates look similar or faster for "low-quartile" children. If we could keep them from being so far behind by grade 2, they apparently wouldn't be so far behind in grade 5!

I don't believe we can make all kids alike. But I think we could do much more to give them similar tools to start with. Some kids may have to work harder to add vocabulary, and educators may have to work harder with some kids. So what's new? Now, unfortunately, educators do virtually nothing before grade 3 or 4 to facilitate real vocabulary growth. By then, it's too late for many children. □



Sadly, as of this 2014 reprinting, attention to vocabulary in schools has not improved very much! Since "Teaching Vocabulary: Early, Direct, and Sequential" was published in *American Educator* in 2001, vocabulary has been recognized as important for school children, but that recognition has not resulted in the changes in curricula or classroom practices that could actually enhance vocabulary acquisition for disadvantaged or second language students.

If you would like to know more, my 2009 book, *Words Worth Teaching*, provides a lot of guidance for vocabulary curricula, and lists 1,600 "priority root words" for primary grade children and an additional list of 2,900 "priority root words" for upper elementary children. The book also includes some practical suggestions for vocabulary instruction and assessment for primary and upper elementary students.[39]

–Andrew Biemiller

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Oral Comprehension Sets the Ceiling on Reading Comprehension

By Andrew Biemiller

To succeed at reading, a child must be able to identify or "read" printed words and to understand the story or text composed of those words. Both identifying words and understanding text are critical to reading success. For many children, increasing reading and school success will involve increasing oral language competence in the elementary years.

The main argument is as follows:

- *During elementary school, a child's maximum level of reading comprehension is determined by the child's level of listening comprehension.*
- *Later, adolescents and adults may comprehend more complex printed narrative or expository text than spoken text.* This is because print remains after reading and can be reviewed, while oral language usually cannot. However, children must reach the point where they can understand printed text as well as spoken text before their comprehension of printed text can exceed their comprehension of spoken text.

- *Children differ markedly in the language and especially the vocabulary they have upon entering kindergarten.* Advanced children (75th percentile or higher) are about a "year" ahead of average children, while delayed children (25th percentile or lower) are about a year behind.[1]
- *Language continues to develop during the primary years.* However, the gap between children with advanced language and children with restricted language grows wider during the elementary years. In elementary school, 90th percentile children differ from 10th percentile children by the grade equivalents of their grade. Thus, at grade 3.9 (end of 3rd grade), the 90th percentile children's reading comprehension and vocabulary are around grade-equivalent 5.4 while the 10th percentile children are at 2.4. (Norms are for the Canadian Test of Basic Skills.[2]) Some of this difference is attributable to cumulative vocabulary deficits in less-advanced children.
- *Current school reading curricula typically have little effect on oral language development during the primary years* b ecause the level of language used is often limited to what the children can read and write, there are few opportunities for language development in

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primary classes. (This is true for children whose first language is English. Non-English-speaking children in English-speaking schools do clearly acquire some English. However, as a group, they also clearly remain at a disadvantage compared to English-speaking children in elementary schools.)

- *In the upper elementary grades, those who enter 4th grade with significant vocabulary deficits show increasing problems with reading comprehension, even if they have good reading (word identification/decoding) skills.* The available evidence does not suggest a substantial "catching-up" process, but rather a continuing slippage relative to those with average and above-average achievement.
- *Thus, early delays in oral language come to be reflected in low levels of reading comprehension, leading to low levels of academic success.* If we are to increase children's ability to profit from education, we will have to enrich their oral language development during the early years of schooling. Although not all differences in language are due to differences in opportunity and learning, schools could do much more than they do now to foster the language development of less-advantaged children and children for whom English is a second language.

The listening comprehension of the average child begins to develop in infancy and continues to grow long after grade 6. Reading comprehension typically begins to develop in kindergarten or 1st grade. At this point, the child's level of reading comprehension is obviously far below her listening comprehension. There is considerable evidence that for the majority of children, comprehension of printed language continues to lag behind comprehension of spoken language well past 3rd grade.[3] When a child can understand language equally well whether presented in print or speech, the distinction between listening and reading comprehension ceases to be important and the child has become "literate." However, a number of studies suggest that average children don't reach the point of being able to read what they could understand if they heard it until around 7th or 8th grade. Of course, they can understand simpler text sooner.

The listening comprehension of the average child begins to develop in infancy and continues to grow long after grade 6.

Listening comprehension continues to grow during the elementary years. Thus a typical 3rd-grader can comprehend more complex oral stories, expositions, etc., than a typical 1st-grader. Broadly speaking, language can only "grow" through interaction with people and texts that introduce new vocabulary, concepts, and language structures. *In grades 1 and 2, this growth cannot result mainly from reading experiences because most children are not reading content that is as advanced as their oral language.* We often assume that children's reading experiences contribute much to their increasing ability to comprehend language.[4] However, for many children, most language growth continues to come from non-print sources (parents, peers, teachers, class discussions, television, etc.) throughout the elementary years. For many children, the skills necessary for reading printed English remain too poor for them to read "grade-level" texts that introduce new vocabulary and new conceptual structures. The problem is even more severe for struggling students. For example, the listening vocabulary level of a 25th percentile 6th-grader is equivalent to that attained by the 75th percentile 3rd-grader. The same is true of reading comprehension measures.

If we could improve the word-identification skills of children at the 25th percentile in reading comprehension, we would get some improvement—up to the child's listening comprehension level. But in many cases, we would still be looking at a child with a comprehension level that is far below that of many peers. *To bring a child to grade-level language comprehension means, at a minimum, that the child must acquire and use grade-level vocabulary plus some post-grade-level vocabulary.* Obviously, this does not mean simply memorizing more words, but rather coming to understand and use the words used by average children at that level. Knowledge of this vocabulary will not guarantee success, but lack of vocabulary knowledge can ensure failure. □

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Beyond Comprehension

We Have Yet to Adopt a Common Core Curriculum That Builds Knowledge Grade by Grade—But We Need To

By E. D. Hirsch, Jr.

The prevailing view of the American educational community is that no specific background knowledge is needed for reading. Any general background knowledge will do. This innocent-sounding idea, so liberating to the teacher and the student, frees schools from any requirement to teach a specific body of knowledge. This purported liberation from "mere" information and rote learning is one of the most precious principles of American educational thought, and lies at its very core. Its proponents disparage those who favor a definite, cumulative course of study for children as "traditional," "hidebound," and "reactionary," to mention only the more polite terms.

Yet the supposedly liberating and humane idea that any general background knowledge will serve to educate children and make them proficient readers is not only incorrect, it is also very old and tired; it has had its day for at least half a century, during which time American reading proficiency and verbal SAT scores have declined drastically.[1] (For a detailed explanation of the drop in SAT scores, see Marilyn Jager Adams's article on page 60 of this volume.) Scapegoats for the decline, such as television and social forces, have been invoked to explain it, but they cannot fully explain why other nations, equally addicted to television but not to American educational theories that disparage "mere" information, have not suffered a similarly drastic decline in reading proficiency.[2]

It is true that given a good start in decoding, a child will develop fluency and accuracy in decoding with practice. And it is also true that decoding is a skill that can be transferred from one text to another. But the progress of a child's reading comprehension is different. That progress does not follow a reliable course of development. Because comprehension is knowledge dependent, someone who reads well about the Civil War may not necessarily read well about molecular interactions.

One particularly elegant experiment was conducted to find out how important domain-specific knowledge is in actual reading tasks.[3] In two of the groups of students studied, one had good decoding skills but little knowledge of the subject, baseball, while another had poor decoding skills but knew a lot about baseball. As predicted, the reading comprehension of the low-skills, baseball-knowing group proved superior to the reading comprehension of the high-skills, baseball-ignorant group. These results have been replicated in other situations and knowledge domains; they show the powerful effect of prior knowledge on actual reading ability.[4]

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Faulty Ideas

Most current reading programs talk about "activating" the reader's background knowledge so she can comprehend a text. But in practice, they are only paying lip service to the finding that background knowledge is essential to reading comprehension. Little attempt is made to enlarge children's background knowledge—and, as a direct result, little is accomplished in terms of expanding children's ability to comprehend more complex and varied texts. The disjointed topics and stories that one finds in current reading programs, such as "Going to School" and "Jenny at the Supermarket," seem designed mainly to appeal to the knowledge that young readers probably already have.

For decades, most professional educators have believed that reading is an all-purpose skill that, once learned, can be applied to all subjects and problems. A specific, fact-filled, knowledge-building curriculum, they hold, is not needed for gaining all-purpose cognitive skills and strategies. Instead of burdening our minds with a lot of supposedly dead facts, they call for us to become expert in solving problems, in thinking critically—in reading fluently—and then we will be able to learn anything we need.

This idea sounds plausible. (If it did not, it could not have so thoroughly captured the American mind.) Its surface plausibility derives from the fact that a good education can indeed create very able readers and critical thinkers. The mistake is to think that these achievements are the result of acquiring all-purpose skills rather than broad factual knowledge. As the study of students' abilities to comprehend a text about baseball demonstrated, reading and critical thinking are always based on concrete, relevant knowledge and cannot be exercised apart from what psychologists call "domain-specific" knowledge.[5]

The idea that reading with comprehension is largely a set of general-purpose skills and strategies that can be applied to any and all texts is one of the main barriers to our students' achievement in reading. It leads to activities (like endless drilling in finding the main idea) that are deadening for agile and eager minds, and it carries big opportunity costs. These activities actually slow down the acquisition of true reading ability: they take up time that could be devoted to gaining general knowledge, which is the central requisite for high reading ability.

Most current reading programs do not prepare students for high school, higher education, the workplace, or citizenship because they do not make a systematic effort to convey coherently, grade by grade, the knowledge that books (including high school textbooks), newspapers, magazines, and serious radio and TV programs assume American readers and listeners possess. (Every newspaper, book, and magazine editor, and every producer for radio and TV is conscious of the need to distinguish what can be taken for granted from what must be explained. The general reader or listener that every journalist or TV newscaster must imagine is somebody whose relevant knowledge is assumed to lie between the total ignorance of a complete novice and the detailed knowledge of an expert.)

Most reading programs only pay lip service to the finding that background knowledge is essential to reading comprehension.

How Much Knowledge Do We Need?

Here is the first paragraph of an article by Janet Maslin, taken at random from the books section of the *New York Times* on February 6, 2003. It is an example of writing addressed to a general reader that a literate American high school graduate would be expected to understand.

> When Luca Turin was a boy growing up in Paris, according to Chandler Burr's ebullient new book about him, "he was famous for boring everyone to death with useless, disconnected facts, like the distance between the earth and the moon in Egyptian cubits." Mr. Burr sets out to explain how such obsessive curiosity turned Mr. Turin into a pioneering scientist who, in the author's estimation, deserves a Nobel Prize.

This example shows that the background knowledge required to understand the general sections of the *New York Times*, such as the book review section, is not deep. It is not that of an expert—of course not, for we cannot all be experts on the diverse subjects that are treated by books. If authors want their books to be sold and read, they must not assume that their readers are experts. They may take for granted only the relevant background knowledge that a literate audience can be expected to possess.

What do readers need to know in order to comprehend this passage? We need to know first that this is a book review, which aims to tell us what the book is about and whether it is worth reading. We need to understand that the reviewer is favorably disposed to the book, calling it "ebullient," and that it is a nonfiction work about a scientist named Luca Turin. We need to have at least a vague semantic grasp of key words like ebullient, boring, obsessive, pioneering, estimation. We need to know some of the things mentioned with exactness, but not others. It's not necessary to know how long a cubit is. Indeed, the text implies that this is an odd bit of information, and we can infer that it is some form of measurement. We need to know in general what Paris is, what the moon is and that it circles the earth, that it is not too far away in celestial terms, and we need to have some idea what a Nobel Prize is and that it is very prestigious. Consider the knowledge domains included in this list. Paris belongs to history and geography; so does Egypt. The moon belongs to astronomy and natural history. The Nobel Prize belongs to general history and science.

We may infer from this example that only a person with broad knowledge is capable of reading with understanding the *New York Times* and other newspapers. This fact has momentous implications for

education, and for democracy as well. A universal ability of citizens to read newspapers or their equivalent with understanding is the essence of democracy. Thomas Jefferson put the issue unforgettably: "The basis of our government being the opinion of the people, the very first object should be to keep that right; and were it left to me to decide whether we should have a government without newspapers or newspapers without a government, I should not hesitate a moment to prefer the latter. But I should mean that every man should receive those papers and be capable of reading them."[6] The last phrase, "be capable of reading them," is often omitted from the quotation, but it is the crucial one. Reading achievement will not advance significantly until schools recognize and act on the fact that it depends on the possession of a broad but definable range of diverse knowledge. Effectively teaching reading requires schools to systematically teach the diverse, enabling knowledge that reading with comprehension requires.

What Knowledge Do We Need?

But what exactly does that enabling knowledge comprise? That is the nuts-and-bolts question. The practical problem of helping all students achieve adequate reading comprehension depends on our schools being able to narrow down what seems at first glance to be vast amounts of heterogeneous information into a teachable repertory that will enable students to understand the diverse texts addressed to the average citizen. Our sketch of the background knowledge needed to understand Maslin's short passage offers clues to the kind of instruction needed to advance general reading comprehension ability. It will be broad instruction in the worlds of nature and culture as a necessary platform for gaining deeper knowledge through listening and reading. But what, exactly, should that broad general knowledge be?

My colleagues Joseph Kett and James Trefil and I set out to answer that question back in the 1980s. We asked ourselves, "In the American context, what knowledge is taken for granted in the classroom, in public orations, in serious radio and TV, in books and magazines and newspapers addressed to a general audience?" We considered various scholarly approaches to this problem. One was to look at word frequencies. If a word appeared in print quite often, then its meaning was probably not going to be explained by the writer. We looked at a frequency analysis of the Brown Corpus, a collection of passages from very diverse kinds of publications that was lodged at Brown University, but we found that this purely mechanical approach, while partially valid, did not yield altogether accurate or intelligent results. For example, because the Brown Corpus was compiled in the 1950s, "Nikita Khrushchev" was a more frequent vocabulary item than "George Washington."[7]

A much better way of finding out what knowledge speakers and writers take for granted is to ask them whether they assume specific items of knowledge in what they read and write. This direct approach proved to be a sounder way of determining the tacit knowledge, because what we must teach students is the knowledge that proficient readers and writers actually use. From people in every region of the country we found a reassuring amount of agreement on the substance of this taken-for-granted knowledge.

We had predicted this agreement. The very nature of communicative competence, a skill that successful teachers, reporters, doctors, lawyers, book club members, and writers have already shown themselves to have, requires that it be widely shared within the speech community. Shared, taken-for-granted background knowledge is what makes successful communication possible. Several years after our compilation of such knowledge was published, independent researchers investigated whether reading comprehension ability did in fact depend on knowledge of the topics we had set forth. The studies showed an unambiguous correlation between knowledge of these topics and reading comprehension scores, school grades, and other measures of reading ability. One researcher investigated whether the topics we set forth as taken-for-granted knowledge are in fact taken for granted in newspaper texts addressed to a general reader. He examined the *New York Times* by computer over a period of 101 months and found that "any given day's issue of the *Times* contained approximately 2,700 occurrences" of these unexplained terms, which "play a part in the daily commerce of the published language."[8]

An inventory of the tacit knowledge shared by good readers and writers cannot, of course, be fixed at a single point in time. The knowledge that writers and radio and TV personalities take for granted is constantly changing at the edges, especially on issues of the moment. But inside the edges, at the core, the body of assumed knowledge in American public discourse has remained stable for many decades.[9] This core of knowledge changes very slowly, as sociolinguists have pointed out. If we want to bring all students to reading proficiency, this stable core is the enabling knowledge that we must teach.

That's more easily said than done. One essential, preliminary question that we faced was this: how can this necessary knowledge be sequenced in a practical way for use in schools? We asked teachers how to present these topics grade by grade and

created working groups of experienced teachers in every region of the country to produce a sequence independently of the others. There proved to be less agreement on how to present the material grade by grade than there had been in identifying what the critical topics are. That difficulty too was predicted, since the sequencing of many topics is inherently arbitrary. While it's plausible that in math, addition needs to come before multiplication, and that in history, Greece probably ought to come before Rome, maybe it's not plausible that Greece should come before George Washington.

We collected the accumulated wisdom of these independent groups of teachers, made a provisional draft sequence, and in 1990 held a conference where 145 people from every region, scholarly discipline, and racial and ethnic group got together to work extremely hard for two and a half days to agree on an intelligent way to teach this knowledge sequentially. Over time, this Core Knowledge Sequence has been refined and adjusted, based on actual classroom experience. It is now used in several hundred schools (with positive effects on reading scores), and it is distinguished among content standards not only for its interest, richness, and specificity, but also because of the carefully thought-out scientific foundations that underlie the selection of topics. (The Core Knowledge Sequence is available online at www.coreknowledge.org.)

Today, in response to requests from educators, the Core Knowledge Foundation offers a range of instructional supports, including detailed teacher guides, a day-by-day planner, and an anthology of African American literature, music, and art. And, we are now offering a complete language arts program for elementary grades. This program, which was pilot tested in 17 urban, suburban, and rural schools, addresses both the skills and the knowledge that young children need to become strong readers and writers. This new program is our attempt to reconceive language arts as a school subject. In trying to make all students proficient readers and writers, there is no avoiding the responsibility of imparting the specific knowledge they will need to understand newspapers, magazines, and serious books. There is no successful shortcut to teaching and learning this specific knowledge—and there is nothing more interesting than acquiring broad knowledge of the world. The happy consequence is a reading program that is much more absorbing, enjoyable, and interesting than the disjointed, pedestrian programs offered to students today.

Most current programs assume that language arts is predominantly about "literature," which is conceived as poems and fictional stories, often trivial ones meant to be inoffensive vehicles for teaching reading skills. Stories are indeed the best vehicles for teaching young children—an idea that was ancient when Plato reasserted it in *The Republic*. But stories are not necessarily the same things as ephemeral fictions. Many an excellent story is told about real people and events, and even stories that are fictional take much of their worth from the nonfictional truths about the world that they convey.

The new Core Knowledge language arts program contains not only fiction and poetry, but also narratives about the real worlds of nature and history. Since word learning occurs much faster in a familiar context, the program stays on each selected subject-matter domain long enough to make it familiar. Such integration of subject-matter content in reading classes enriches background knowledge and enlarges vocabulary in an optimal way.

Constantly Changing Schools—A Critical Issue

Thus far, I've mostly been explaining the need for a fact-filled, knowledge-building curriculum. But the critical issue of student mobility demands more than just each school adopting or adapting such a curriculum. If we are really to serve all of our children to the best of our ability, then nothing short of a common curriculum—one shared by all schools—will do.

Mobility is a term to denote students' moving from one school to another in the middle of the year. The percentage of economically disadvantaged students who migrate during the school year is appallingly high, and the effects are dishearteningly severe. One study has analyzed those effects on 9,915 children. With this large group, the researchers were able to factor out the influences of poverty, race, single-parent status, and lack of parental education in order to isolate just the effects of changing schools. Even with other adverse influences factored out, children who changed schools often were much more likely than those who did not to exhibit behavioral problems and to fail a grade.[10] The researchers found that the adverse effects of such social and academic incoherence are greatly intensified when parents have low educational levels and when compensatory education is not available in the home. But this big fact of student mobility is generally ignored in discussions of school reform. It is as if that elephant in the middle of the parlor is less relevant or important than other concerns, such as the supposed dangers of encouraging uniformity or of allowing an "outsider" to decide what subjects are to be taught at which grade level.

> Long-term memory is not used to store isolated facts, but to store huge complexes of integrated information that result in problem-solving skill.

In a typical American school district, the average rate at which students transfer in and out of schools during the academic year is about one-third.[11] In a typical inner-city school, only about half the students who start in the fall are still there in the spring—a mobility rate of 50 percent.[12] Given the curricular incoherence in a typical American school (in which two fourth-grade classrooms may cover completely different content), the education provided to frequently moving students is tragically

fragmented. The high mobility of low-income parents guarantees that disadvantaged children will be most severely affected by the educational handicaps of changing schools, and that they will be the ones who are most adversely affected by lack of commonality across schools.

The finding that our mobile students (who are preponderantly from low-income families) perform worse than stable ones does not mean that their lower performance is a consequence of poverty. That is to commit the fallacy of social determinism. Where there is greater commonality of the curriculum, the effects of mobility are less severe. In a summary of research on student mobility, Herbert Walberg states that "common learning goals, curriculum, and assessment within states (or within an entire nation) ... alleviate the grave learning disabilities faced by children, especially poorly achieving children, who move from one district to another with different curricula, assessment, and goals."[13] The adverse effects of student mobility are much less severe in countries that use a nationwide core curriculum.

While ignoring important issues like mobility that really do impede learning, some people blame ineffective teachers for students' lackluster performance. But so-called low teacher quality is not an innate characteristic of American teachers; ineffective teaching is the consequence of the ineffective training they have received and of the vague, incoherent curricula they are given to teach, both of which result from most education schools' de-emphasis on specific, cumulative content. No teacher, however capable, can efficiently cope with the huge differences in academic preparation among the students in a typical American classroom—differences that grow with each successive grade.[14] In other nations, the differences between groups diminish over time, so that they are closer together by grade 7 than they were in grade 4.[15] Even the most brilliant and knowledgeable American teacher faced with huge variations in student preparation cannot achieve as much as an ordinary teacher can within a more coherent curricular system like those found in the nations that outperform us.

The chief cause of our schools' inefficiency is precisely this curricular incoherence.[16] At the beginning of the school year, a teacher cannot be sure what the entering students know about a subject, because they have been taught very different topics in prior grades, depending on the different preferences of their teachers. Typically, therefore, the teacher must spend a great deal of time at the beginning of each year reviewing the preparatory material students need to know in order to learn the next topic—time that would not need to be so extensive (and so very boring to students who already have the knowledge) if the incoming students had all been taught using a common core curriculum and thus had all gained this knowledge already.

If states would adopt a common core curriculum that builds knowledge grade by grade, reading achievement would rise for all groups of children. So would achievement in math, science, and social studies because, as common sense predicts, reading is strongly correlated with the ability to learn in all subjects. Equally important, the achievement gap between social groups would be greatly narrowed and social justice would be served. □

Endnotes

1. There is a large literature on the decline of verbal SAT scores in the 1960s and 1970s, and on NAEP (National Assessment of Educational Progress) scores when these began to be collected in the 1970s. A summary of these issues with full bibliographical references can be found in E. D. Hirsch, Jr., *Cultural Literacy* (Boston: Houghton Mifflin, 1987), 1–10; and E. D. Hirsch, Jr., *The Schools We Need* (New York: Doubleday, 1996), 39–42, 176–79.

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3. D. R. Recht and L. Leslie, "Effect of Prior Knowledge on Good and Poor Readers' Memory of Text," *Journal of Educational Psychology* 80, no. 1 (March 1988), 16–20.

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Advancing our Students' Language and Literacy

The Challenge of Complex Texts

By Marilyn Jager Adams

Few Changes on SAT Posted by Class of 2010."[1] "Scores on SAT College Entrance Test Hold Steady."[2] "Class of 2008 Matches '07 on the SAT."[3] Year by year, point by point, it is hard to see the real news in these headlines. The real news is not that the SAT scores have held steady. The real news is that the SAT scores haven't increased. The SAT scores of our college-bound students have been languishing not for one or two years, but for a long time. Several decades ago, scores were much higher.

The SAT score decline began in 1962, nearly 50 years ago. From 1962 to 1980, math scores fell 36 points to 492 while verbal scores fell 54 points to 502. Since 1980, the math scores have been gradually climbing back and are now at 516. Fluctuations aside, the verbal scores remain unchanged, even today stuck at 502.

If I were writing the headline for the next newspaper story on the SATs, here's what you'd see: "Seniors and Their SAT Scores Sabotaged by Low-Level Textbooks." And if the copyeditor would let me, I'd add an exclamation point! The literacy level of our secondary students is languishing because the kids are not reading what they need to be reading. This is a strong claim. Let me lay out the evidence and argument so you can judge for yourself.

Not Just the SAT Scores

To be sure, whether scores on the SAT exams truly reflect relevant or important intellectual or academic proficiencies remains a topic of discussion.[4] Yet, the SATs are not the only indication that the literacy growth of our secondary students has fallen behind.

Between 1994 and 1998, the United States joined 19 other developed countries in an international evaluation of adult literacy levels.[5] As compared with their peers in the other countries, the literacy scores of older U.S. adults (36 years old and up) were quite high, ranking in the top five. In contrast, the scores for younger U.S. adults (35 years old or less) ranked in the bottom half of the distribution by every measure. Among young adults with a high school diploma or less, those from the United States fell at the bottom of the pile, ranking 19th out of 20. Even among participants who had completed four or more years of postsecondary education, the scores of our young adults were below the average for same-aged and like-educated peers in the other countries. The young adults in this study would have graduated from high school between 1974 and 1998, during the period when the verbal SAT scores were bottoming out.

In international assessments of schoolchildren, the performance of our fourth-

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graders is above average. However, the performance of our high school students is average, at best.[6] The results of our own National Assessment of Educational Progress (NAEP) show a similar contrast: while the reading of younger students has been improving over time, that of older students has not. NAEP's analysis of changes in reading performance between 1971 and 2008 shows that average scores of 9-year-olds increased by 12 points. Those of 13-year-olds increased by 4 points. But the average scores of 17-year-olds have not changed.[7] The lack of progress among 17-year-olds is especially jarring when factoring in our dropout problem. Roughly 25 percent of eighth-graders nationwide drop out of school before completing high school;[8] presumably, those who stay in school, and therefore participate in NAEP as 17-year-olds, disproportionately include the more successful and motivated students. One can't help but wonder whether they were trying hard when they took the tests, since there is no personal consequence for doing well or poorly on the international trials or the NAEP.

On the other hand, college entrance examinations are voluntary, and performing well on them is the very point of taking them. ACT (known until 1996 as the American College Testing Program) tracked the literacy scores of eighth-, tenth-, and twelfth-graders on ACT college readiness and entrance exams.[9] For each of the cohorts examined (and regardless of gender, race/ethnicity, or household income), the students were collectively on track in the eighth and tenth grades for better scores than they ultimately obtained in the twelfth grade. ACT's report concludes that there is a specific problem at the secondary school level.*

Taking a closer look at the poor performance of students on its college entrance exam, ACT determined that the major stumbling block for students is complex texts. The maximum score on the reading component of the ACT college entrance exam is 36; scores of less than 21 predict reading difficulties in college coursework and also in the workplace. Among students who took the ACT exam in 2005, the scores of 51 percent—more than half—fell below 21. And among that 51 percent, average performance on the complex texts was at chance levels (i.e., random guessing would produce the same scores).

*The same conclusion was drawn by the College Entrance Examination Board in the mid-1970s and again in the mid-1980s.10

SAT Decline Prompts Investigation

Back in 1977, having watched SAT scores fall for 15 years, the College Board, which developed and administers the SAT, engaged a panel to try to identify the underlying causes of the decline.[11] A first hypothesis to be checked was whether the test had somehow become more demanding. But, no, to the contrary, indications were that scoring had become more lenient.[12] A second prominent hypothesis was that the decline was due to changes in the demographics of the test takers. Analyses showed this hypothesis to be largely correct, but only for a brief while. Over the early 1960s, changes in the composition of the tested population accounted for as much as three-quarters of the test score decline—and, no wonder, for during this period the number of students taking the SAT tripled. Over the 1970s, however, though the test-taking population stabilized, the scores did not. Instead, the decline continued, even steeper than before, while the extent to which it could be ascribed to demographic shifts shrank to 30 percent at most.[13] Furthermore, the scores that dropped most were those of the strongest students, the students in the top 10 percent of their class; the scores of students toward the bottom of the distribution held steady or even increased.[14]

Another hypothesis examined by the College Board's panel was that the reading selections on the tests had somehow become too hard for the students. Reading researcher Jeanne Chall and her colleagues tested this hypothesis by sampling passages from SAT tests administered between 1947 and 1975, and using readability analyses to compare their difficulty.[15] The data indicated that the SAT passages had actually become easier over this period—so scores should have been going up. Further, between 1963 and 1975, during the years of the score decline, the average difficulty of the test passages lay at the eleventh-grade level, which should have been solidly in range for twelfth-grade college-bound students. Yet scores were going down.

Chall thought there had to be some reason why the twelfth-graders were not able to read eleventh-grade texts. With this in mind, she and her colleagues evaluated popular eleventh-grade textbooks in history, literature, grammar, and composition. The average difficulty of the textbooks lay between the ninth- and tenth-grade levels.

Could this discrepancy between the reading level of the SAT and that of the textbooks explain the score decline? If students had neither practiced nor been instructed with reading materials as hard as the SAT passages, then one could hardly expect them to read the latter with competence and confidence.

By the early 1990s, SAT scores appeared to have plateaued. The College Board decided to "recenter" the scale by adding about 80 points to the verbal scores (and about 25 points to the math scores) so as to return the mean of each test to a value close to 500 points.† Beleaguered, the College Board also changed the name of the test from the Scholastic Aptitude Test to simply the SAT, with the letters standing for nothing.

A Closer Look at Textbooks

In the 1980s and 1990s, another team of researchers, led by Donald P. Hayes, returned to Chall's hypothesis, extending her work with a revealing series of studies.

In one of the most extensive, they analyzed the difficulty of 800 elementary, middle, and high school books published between 1919 and 1991.[16] Their results indicated that the difficulty of the text in these books had been significantly reduced and, further, that the years over which this reduction occurred were temporally aligned with the SAT score decline.

As one indication of this trend, the average length of the sentences in books published between 1963 and 1991 was shorter than that of books published between 1946 and 1962. In the seventh- and eighth-grade textbooks, for example, the mean length of sentences decreased from 20 words to 14 words—"the equivalent of dropping one or two clauses from every sentence."[17] Meanwhile, the sophistication of the books' wording also declined. The wording of schoolbooks published for eighth-graders from 1963 forward was as simple as that in books used by fifth-graders before 1963. Worse, among literature texts required in English classes, the wording of twelfth-grade texts published after 1963 was simpler than the wording of seventh-grade texts published prior to 1963.

Continuing their investigation, the researchers found that it was especially schoolbooks for students in grades 4 and up that were simplified in the years after 1962. Moreover, although the wording of schoolbooks for children generally increased across grades 1 through 8, the same was not true of high school books. Across grades 9 through 12 (including texts for Advanced Placement courses), the difficulty levels of the literature books were shown to differ little from one another or from the grade 7 and grade 8 offerings. One bright spot was high school students' science texts, which were significantly more difficult than their English books. However, even among science texts, only those designated for Advanced Placement coursework evidenced difficulty levels comparable to that of the average daily newspaper for adults.

Such a disparity between the students' schoolbooks and the passages on the SAT might well explain the decline in SAT scores. More significantly, failing to provide instruction or experience with "grown-up" text levels seems a risky course toward preparing students for the reading demands of college and life.

†The scores given in the introduction are all on the new, recentered scale.

To wit, while the analyses of Hayes and his colleagues showed that textbooks had become progressively easier over the century, they also indicated that the difficulty of English language newspapers had remained nearly constant.[18] Could this disparity be a factor in the declining circulation of newspapers? Similarly, they found the level of the wording of scientific magazines, whether aimed at professionals or laypersons, had increased dramatically from 1930 to 1990.[19] If it is a national goal to inspire more students to become engineers and scientists, then shouldn't the difficulty of our schoolbooks have increased alongside? If a goal is to ensure that our students will be able to stay sufficiently informed about scientific progress to conduct business, reflect on policy, and manage their family's health and education, then at a minimum, shouldn't the difficulty of our schoolbooks keep pace with the difficulty of scientific publications aimed at the general public?

An analysis of 800 schoolbooks published between 1919 and 1991 found that the difficulty of the text had been significantly reduced.

The Vocabulary of Written Language

Reading educators have long appreciated that there is a very strong relationship between vocabulary and reading comprehension. But what exactly is it about the wording of texts that underlies this relation? Part of the answer is that written texts draw upon many more words than normally arise in oral language situations.[20]

To gain insight into this phenomenon, Hayes and colleagues compared spoken language with texts.[21] For this study, they focused on trade publications rather than school materials, and the texts they used included preschool books, children's books, comic books, adult books, magazines, newspapers, and abstracts from scientific magazines. For comparison, they compiled and analyzed a variety of oral language samples, including language from prime-time adult television shows, children's television shows, mothers' speech to children ranging in age from infancy to adolescence, conversations among college-educated adults (including from the Oval Office), and adults providing expert witness testimony for legal cases. Regardless of the source or situation and without exception, the richness and complexity of the words used in the oral language samples paled in comparison with the written texts. Indeed, of all the oral language samples evaluated, the only one that exceeded even preschool books in lexical range was expert witness testimony.

This difference between the wording of oral and written language must lie at the crux of the advanced literacy challenge, as it points to a profound dilemma. On the one hand, the extent of this disparity implies that the great majority of words needed for understanding written language is likely to only be encountered—and thus can only be learned—through experience with written text. On the other hand, research has taught us that written text is accessible—and thus permits learning—only if the reader or listener already knows the vast majority of words from which it is constructed. Indeed, research indicates that reading with comprehension depends on understanding at least 95 percent of the words of a text.[22]

How Many New Words Do Readers Need to Learn?

So roughly how many words do kids need to learn in order to be proficient readers? This question raises the second key part of the vocabulary problem.

Suppose you counted the number of times each different word in this article occurred. What you would find is that there are a few words that I have used quite a number of times, and many, many others that I used only once or twice. This distribution of word counts or frequencies is an example of what is known as Zipf's law.[23]

According to Zipf's law, every natural language sample is made up of relatively few words that recur over and over again, and many, many words that arise very infrequently. The type of natural language sample does not matter and, provided that it is not too short, neither does its size. That is, whether you counted all the words in a casual conversation, a lecture, a newspaper article, a whole book, or even a whole library's worth of books, you would find the same thing: of all the different words in your sample, a small number would occur over and over again, while many, many others would occur only once.

Zipf's law may feel intuitively obvious. Less obvious, however, are its implications with respect to the vocabulary challenge.

An example may vivify the issue. Counting words that appear in relevant text is a common approach to making dictionaries. For example, if you wanted to make a dictionary for geologists, you might begin by gathering a sample of the kind of articles about geology that you think your customers would like to read and then counting the number of occurrences of all the different words within them. The goal is to make sure your dictionary contains all the words that your customers will want to look up most.

Similarly, as part of creating *The American Heritage School Dictionary*[24] John Carroll and his colleagues were asked to figure out which words should be included by examining children's reading materials. To do this, the team gathered texts that had been written especially for children in grades 3 through 8, taking care that the collection as a whole captured the range of different kinds of text and topics that the children might read in amounts that were proportionate to how often they could be expected to read them. From across these materials, the team then extracted 10,000 excerpts, totaling 5 million words of text in all, which, after sorting, turned out to include 86,741 different words. Their job was then to figure out which of these 86,741 words arose sufficiently often to warrant inclusion in the dictionary.[25]

Enter Zipf's law. Just 109 very frequent words accounted for fully half of the vast sample of children's reading material that Carroll and colleagues had put together. Indeed, 90 percent of the sample was accounted for by just 5,000 relatively common words. At the other extreme, more than half of the words appeared only once. Still worse: the team estimated that the actual number of different words in the children's reading materials—that is, the number of different words that would have turned up if they had counted such texts exhaustively rather than just working with excerpts—would have totaled 609,606. Due to Zipf's law, a sample of 5 million words was just plain too small even to identify—much less to judge the relative frequency of—the vast majority of words that might well have belonged in the dictionary.

We must organize our readings in every subject so each text bootstraps the language and knowledge needed for the next.

But hold it. We are talking about materials that are specifically written for and meant to be understood by schoolchildren in grades 3 through 8. How can they possibly be expected to know more than 600,000 different words?

In fact, many of these words are cousins of each other. For example, if a child knows the word *shoe*, then she or he is unlikely to experience difficulty with *shoes*. Similarly, a child probably won't have trouble with word families like *walk, walked*, and *walking*. Pushing this reasoning further, vocabulary researchers Bill Nagy and Richard Anderson[26] have argued that students shouldn't have problems with any sort of prefixing, suffixing, or compounding of a word, provided that the meaning of the word's base is preserved. As examples, they suggested that if children know the word elf, they should have little problem with elfin or with pairs such as *cow/cowhand, know/knowledge, therapy/therapeutic,* and *represent/misrepresent*. Eliminating all such "closely related" words from the word count that Carroll and colleagues had done for the dictionary, and keeping only base words plus affixed or compound words whose meanings are harder to figure out from their base words (such as *vice/vicious, well/farewell, shift/shiftless, fix/prefix*), Nagy and Anderson estimated that the actual number of separate words that children need be taught is closer to 100,000. If Nagy and Anderson's elimination rules were too aggressive given children's word sense, then the actual number might be double or triple their estimate. And, of course, if we extend concern from grade-school materials to advanced texts, the actual number must be larger still.

Developing Students' Vocabulary: Examining the Options

So, what is the best way to help students master the many, many words they must know to understand advanced texts? In broad terms, there appear to be only two options: (1) to endeavor to teach students the words they will need to know, and (2) to expect students to learn new words through reading.

Is direct vocabulary instruction worthwhile? Based on a highly regarded meta-analysis, the answer seems to be a resounding "yes."[27] Across studies involving a variety of students, instructional specifics, and outcome measures, the meta-analysis showed that direct vocabulary instruction significantly increases knowledge of words that are taught. Just as importantly, students who received vocabulary instruction were found to perform significantly better on global nonspecific vocabulary measures such as standardized tests, indicating that such instruction promotes learning of words beyond those that have been explicitly taught (e.g., being taught a word like *aquarium* helps with indirectly learning words like *aquatic, aqueduct, and aqueous*).

However, we must bear in mind that, by its very nature, direct vocabulary instruction admits coverage of precious few words relative to the magnitude of the challenge. Even if, beginning in grade 1 and continuing through grade 12, teachers consistently taught—and students perfectly retained—20 vocabulary words each and

every week, the gain in vocabulary would total only 8,640 words in all (20 words × 36 weeks of school × 12 years), many times fewer than what is required.

Such considerations have led some scholars to argue that the only feasible means by which students might acquire an adequate reading vocabulary is through the process of inferring the meaning of each new word from its context in the course of reading.[28] Indeed, research shows that the probability that students understand and retain any given new word that they encounter in print is 0.05.[29]

So how far will this get them? Researchers have (generously) estimated that median, middle-class, fifth-grade students read close to 1,000,000 words of text per year, in school and out.[30] Based on Carroll and colleagues' research, we can expect a million words of reading to include roughly 17,200 different words. If we suppose that the students already know one-quarter of the words in their texts, then the number of new words they should encounter through this reading would equal 12,900 per year. Yet, if the likelihood that the students will understand and retain each of these words is only 0.05, then their vocabulary can only be expected to grow by 645 per year, giving them but 5,160 new words by the time they graduate from high school.

Recalling that even texts that are for students in grades 1 through 8 presume knowledge of at least 100,000 different words, it is clear that both estimates for learning vocabulary fall way short of the need. At the same time, however, both estimates also seem at odds with the intuitive sense that a high school student need be neither a genius nor a tireless scholar to read and understand most materials written for grade-school children.

Insights from a Computer Model of Vocabulary Acquisition

For another way to think about vocabulary acquisition, let's consider an intriguing computer model called Latent Semantic Analysis (LSA) that was developed by Tom Landauer and his colleagues.[31] The core mechanism underlying the LSA model is "associative learning." When a text is input into the LSA model, the computer builds an association between each individual word of the text and the total set of words—that is, the context—in which the word has appeared. Where a word shows up in multiple contexts, the strength of the association between the word and each of the separate contexts is weakened through competition. Where a word arises repeatedly in one particular context, the association between the two is strengthened.

Importantly, the associations between words and contexts in the LSA model are bidirectional. That is, there are links from each word to each of its contexts and also from each context to all of its words. As a result, the full complex of knowledge that is called forth as each word is "read" extends through its contexts to other words, and through those words to other contexts and words. Thus, as the model "reads" the next word of the text and the next and the next, activation spreads to other, related complexes of knowledge, which may well include clusters that have never before been directly represented by any combination of words and contexts the model has ever "read" before.

Inference and comprehension strategies seem to do little to compensate for weak domain knowledge.

Moreover, because the model's knowledge is represented relationally, the addition or modification of any one connection impacts many others, pulling some closer together, pushing some further apart, and otherwise altering the strengths and patterns of connections among words and contexts. Through this dynamic, reading causes the connections that collectively capture LSA's knowledge of words to grow, shrink, and shift continuously, continually, and always in relation to one another.

In short, the model's response to any text it "reads" extends well beyond what is denoted by the specific words of the text. Further, the richness of the model's representation of any text that it "reads" depends on how much it already knows. Just as with people,[32] the larger its starting vocabulary and the more it has read before, the more it will learn and understand from the next text.

In comparing LSA's word-learning to that of schoolchildren, the researchers began by "training" it with a set of texts judged comparable to the lifelong learning of a typical seventh-grader. The researchers then gave the model new texts to "read" and measured its vocabulary growth. The results showed that the likelihood that the computer gained adequate understanding of new words it encountered in these new texts was 0.05—just exactly the same as researchers have found for schoolchildren.[33]

But the results showed something else, too. It turned out that, with each new reading, the model effectively increased its understanding not just of words that were in the text but also of words that were not in the text. Indeed, measured in terms of total vocabulary gain, the amount the model learned about words that did not appear in a given reading was three times as much as what it learned about words that were in the reading.

"What?" we cry, "How can that be? How can reading a text produce increases in knowledge of words that it does not even contain? That is not credible! It makes no sense!" But wait. If we were talking about knowledge rather than words, then it would make lots of sense. Every concept—simple or complex, concrete or abstract—is learned in terms of its similarities, differences, and relationships with other concepts with which we are familiar. As a simplistic example, when we read about tigers, then, by dint of both similarities and contrasts, we learn more about all sorts of cats and, further, about every subtopic mentioned along the way. The more deeply we read about tigers, the more nuanced and complex these concepts and their interrelations become.

As explained earlier, it was to be expected that LSA's full response to any new text would spread beyond the content of the text itself. The unexpected discovery was that this dynamic would impact the model's understanding of individual words. Given that words are really nothing

more than labels for interrelated bundles of knowledge, perhaps this should not have been surprising.

In the study that modeled a seventh-grader, the researchers were able to gauge LSA's overall vocabulary growth by computationally examining changes in the representation of every word to which it had ever been exposed. Yet here is a mull-worthy correlate: unavoidably, the bundles of concepts and relations that emerged or were strengthened through LSA's reading experience included many that pertained to words that the model had never seen before. An analogous effect might explain why researchers have found time and again that the strength of students' vocabulary predicts the likelihood that they will learn new words from context,[34] the probability that they will correctly infer a new word's meaning from context,[35] and both the amount and nature of their reasoning when they are asked to explain how they do so.[36] Even when students are told the meaning of a new word, their prior vocabulary strength predicts the likelihood that they will retain it.[37] (These are known as "Matthew effects," referring to the notion that the rich get richer and the poor get poorer.) As the reader's linguistic and conceptual knowledge grows in richness and complexity, it will increasingly support the meanings of many new words and the representation of many new spheres of knowledge.

Cognitive psychologists broadly agree that the meaning of any word consists of bundles of features and associations that are the cumulative product of the reader's experience with both the word in context and the concepts to which it refers. What is unique about the LSA model is its demonstration that this structure and dynamic can so richly and powerfully evolve through accrued experience with the various contexts in which words do and do not occur—that is, sheerly through reading.

Another way to state the larger point here is that words are not just words. They are the nexus—the interface—between communication and thought. When we read, it is through words that we build, refine, and modify our knowledge. What makes vocabulary valuable and important is not the words themselves so much as the understandings they afford. The reason we need to know the meanings of words is that they point to the knowledge from which we are to construct, interpret, and reflect on the meaning of the text. A core implication of the LSA model is that students' knowledge of words grows less through any process of inferring their meanings, one by one, based on the sentences in which they arise, than as a product of learning more generally about the contexts in which they arise and of understanding the concepts and relationships to which they refer.

Knowledge, Cognitive Strategies, and Inferences

If reading results in so rich a network of knowledge through nothing more than overlaps and contrasts in associations, then shouldn't students learn far more efficiently, given active, incisive inference and comprehension strategies? Research indicates that such strategies can be taught and suggests that doing so may improve comprehension.[38] However, inference and comprehension strategies seem to do little to compensate for weak domain knowledge.[39] Instead, research repeatedly shows prior domain knowledge to be a far stronger predictor of students' ability to comprehend or to learn from advanced texts.[40] Of course, students' comprehension and learning is also influenced by their reading skills (such as decoding and fluency). But even the advantage of strong reading skills turns out to be greatest for students with strong domain knowledge.[41]

Again, such findings should not be surprising. Cognitive research affirms that there are two modes of reasoning.[42] The first, most common mode is knowledge-based. This sort of reasoning is rapid, extensive, and automatic. This is the sort of reasoning that ensures, for example, that we properly understand the meaning of fan depending on whether the text is about a soccer fan, a ceiling fan, or a peacock's fan. This is the sort of reasoning that computer models such as LSA statistically emulate.

The second mode of reasoning is conscious and rule-based. Such logical, analytic thought also warrants instructional attention in our schools, as it is our means of deliberately evaluating and vetting our thoughts for bias, happenstance, and inconsistencies. However, no reasoning strategy, however well-structured, can rival the speed, power, or clarity of knowledge-driven understanding;[43] nor can it compensate for an absence of sufficient information.

There may one day be modes and methods of information delivery that are as efficient and powerful as text, but for now there is no contest. To grow, our students must read lots. More specifically, they must read lots of "complex" texts—texts that offer them new language, new knowledge, and new modes of thought. Beyond the basics, as E. D. Hirsch, Jr., the founder of Core Knowledge, has so forcefully argued, the reading deficit is integrally tied to a knowledge deficit.[44]

Back to the Classroom: A Strategy for Developing Advanced Reading

The capacity to understand and learn from any text depends on approaching it with the language, knowledge, and modes of thought, as well as the reading skill, that it presumes. It would seem, then, that when assigning materials from which students are to learn, there are basically but two choices. Either the materials must be sufficiently accessible in language and concept for the students to read and understand on their own, or the students must be given help as they read. Some students receive such help in their homes, but many do not and, as I have argued elsewhere, this is likely the major factor underlying the achievement gap.[45] In any case, because opportunities for one-on-one reading assistance are limited in the typical school setting, educators often feel that their only alternative is to restrict assignments to materials that are within their students' independent reach. There follows the popularity of so-called high-low texts, intended to offer high interest or information alongside low demands on vocabulary and reading skill.

It was in this spirit, through earnest efforts to ensure full curricular access to all,

that the complexity of schoolbooks came to be relaxed. Sadly, as this strategy pulled vortically upon itself, it did not solve the access problem but, instead, made it worse. In terms of literacy growth, making the textbooks easier is an approach that ultimately denies students the very language, information, and modes of thought they need most in order to move up and on. Is there any escape from this dilemma?

The answer is yes, there is, and it follows directly from Zipf's law. Again, according to Zipf's law, every coherent text is made up of a few words that recur again and again, and many words that occur just once or only a few times. And, again, Zipf's law is shown to hold for virtually every natural language domain, regardless of its size, topic, modality, or sophistication.

Let us first consider the implications of Zipf's law with respect to word-frequency counts such as the one undertaken for *The American Heritage School Dictionary*.[46] Recall that the goal of such large frequency counts is to capture as broad and representative a picture of the language as possible. For this reason, the collective texts from which they are constructed are chosen to represent as broad and representative a range of topics and genres as possible while avoiding repetition of any particular topic or text. A consequence of this text-sampling strategy is that the low-frequency words within these word counts fall into two different categories. In the first category are words that are rare because they are complex, technical, obsolete, or esoteric (e.g., *caprifoliaceous, omphaloskepsis*, and *mumpsimus*). In the second category, however, are words that are rare because their meanings are relatively specific and are often tied to specific contexts, topics, and genres.[47] For example, a high-frequency word such as home may be expected in texts of many different types and topics of which only a small subset would accept such low-frequency synonyms as *condominium, wigwam, hospice, habitat, birthplace, burrow*, or *warren*. The same holds for the high-frequency word strong versus the more specific alternatives *valid, virile, tensile, pungent, dominant, vibrant, durable, lethal, tyrannical*, and *undiluted*. More generally, the greater the information that a word carries, the fewer the topics and contexts in which it will arise.

Because words in both of these two categories are low frequency, both tend to be excluded by readability formulas that are based on large word-frequency counts. Yet, the "information" in a text is shown to depend disproportionately on words in this second category.[48] Because of this, when words in this second category are removed or substituted so as to "simplify" the text, much of the information in the text is removed along with them.

A benefit of a common core curriculum would be an overhaul of the texts we give students to read, and the kind of learning and thought we expect their reading to support.

A more specific statement of Zipf's law is this: which words appear frequently and infrequently in any given text depends on what the text is about. So, in a text about cooking, the word *habitat* would be infrequent, but in a text about ecology, it would not. The problem with large word-frequency counts—and, by extension, with the readability formulas that are based on them—is that, by design, the texts from which they are generated are collectively topic-neutral. Similarly, if your students were to read a little of this and a little of that, without rereading anything or dwelling on any topic, then the likelihood of their encountering any given information-bearing word would be quite small.

In contrast, if your students read several texts on a single topic, they would encounter a number of domain-specific, information-bearing words. In such texts, the words that rise to the top are those most useful for describing the concepts and relationships that are central to that topic. For example, a quick sampling of informational texts about Mars that I picked off the Internet affirms that, without exception, and whether the intended audience was young children or scientists, the nouns *Mars* and *planet* are among the five most frequent in each. The balance of the dominant nouns in each text depends on the subtopic in focus—variously, its moons, its geography, our efforts at its exploration, etc.

With this in mind, and combined with what else we know about literacy growth, Zipf's law prescribes a self-supporting strategy for developing the sorts of knowledge structures that complex texts require. That is, we know that even for young[49] and delayed[50] readers, any new word encountered (and identified correctly) in print becomes a sight word with little more than a single encounter, provided its meaning is known. We know that the more that students already know about the topic of a text, the greater their understanding and learning will be as they read.[51] We know that vocabulary strength predicts the speed and security with which students learn the meanings of unfamiliar words, whether through reading[52] or direct instruction.[53]

The challenge, then, lies in organizing our reading regimens in every subject and every class such that each text bootstraps the language and knowledge that will be needed for the next. Zipf's law tells us that this can be done by carefully sequencing and scaffolding students' reading materials within any given topic. Ideally, such scaffolding would begin on the very first day of school, with prekindergarten and kindergarten teachers reading aloud stories and nonfiction texts that build on each others' vocabulary and ideas.

Teachers in any grade (and parents) would do well to follow this relatively straightforward strategy:

1. Select a topic about which your students need to learn. (There will be plenty of time for other topics once you've started this process.) If the students are below grade level, begin with shorter, simpler texts.

2. Teach the key words and concepts directly, engaging students in using and discussing them to be sure they are well anchored.

3. As the students learn the core vocabulary, basic concepts, and overarching schemata of the domain, they will become ready to explore its subtopics, reading (or

having read aloud to them) as many texts as needed or appropriate on each subtopic in turn.

Gradually and seamlessly, students will find themselves ready for texts of increasingly greater depth and complexity. Better yet, as their expertise on, say, Mars, expands, they will find themselves in a far better position to read about Venus, Jupiter, earth sciences, space exploration, and on and on.

Can advanced texts really be made accessible to less proficient readers in this way? Yes. As a concrete example, no text on dinosaurs would get through a readability formula for second-graders. However, having built up their vocabulary and domain knowledge, many second-graders are able to read and understand remarkably sophisticated texts about dinosaurs with great satisfaction. Similarly, I have rarely met a Boston cabby—no matter how much he decried reading—who wasn't quick to pick up and read a news article about the Red Sox. Knowledge truly is the most powerful determinant of reading comprehension. The greatest benefits of literacy grow through reading deeply in multiple domains and about multiple topics. We can and must do a better job of leading—and enabling—our students to do so. If education is the key to opportunity, then their options, in school and beyond, depend on it.

The Role of a Common Core Curriculum

There are some who object reflexively to the notion of a common core curriculum. Yet, if you think about it, the very concept of publicly supported schooling is predicated on the belief that there is a certain body of knowledge and abilities that is needed by every citizen for a safe, responsible, and productive life.

Under the Massachusetts School Law of 1642, every town was made responsible for teaching every child "to read perfectly the English tongue," and to understand the capital laws of the commonwealth and the principles of religion, as well as for ensuring every child was provided an apprenticeship in "some lawful calling, labour, or employment." In effect, these requirements constituted the colony's common core curriculum.

In the centuries since then, responsibility for our children's religious education has been reassigned from the school to families and churches. However, the educational and literacy levels required by the other dimensions of life, liberty, and the pursuit of happiness have exploded. In our times, written language has become the major medium not just for education but for information in every aspect of life. Further, as priest, professor, and historian Walter Ong has pointed out, the ubiquity of audio support hardly matters: written language is the underlying medium for educated communication regardless of modality.[54]

The arguments for a common core curriculum are partly that it would be readily accessible to every teacher and school, partly that it would provide continuity and coherence for the millions of students who frequently change schools (an issue E. D. Hirsch, Jr., explores beginning on page 55 of this volume), and partly that a vocabulary-building curriculum is too big and too hard a job for any teacher or school to put together alone. Creating each unit, for each grade K–12, will depend on judicious selection not just of topics but of the reading materials comprising each unit. From the billions of pages of print that are available, finding those that are both well written and appropriate will take work. The task of building a good core curriculum will require intense effort by teams of educators and scholars, including the best minds and sensibilities available.

In creating a common core curriculum, the goal is neither to dictate nor to limit what all students should be able to know and do. As detailed within the Winter 2010–2011 issue of *American Educator*, the core curriculum might fill only two-thirds of students' instructional time. Perhaps, too, the units would be populated with alternate sets of readings. After all, as reviewed in this article, the greatest benefit of a well-structured program of reading and learning is that it prepares the student to read other materials with competence and thoughtful comprehension. If education is to nurture interest and support relevance, it must also leave room for some choice. The purpose of a core curriculum is to build the foundations that will put students in good stead to choose and pursue what they wish to learn and do—which, of course, depends integrally on their being able to learn and do it.

From my perspective, a great benefit of a common core curriculum is that it would drive a thorough overhaul of the texts we give students to read, and the kinds of learning and thought we expect their reading to support. Amid the relatively few SAT headlines this fall, the one written by the College Board, which administers the SAT, stood out: "2010 College-Bound Seniors Results Underscore Importance of Academic Rigor."[55] As the College Board went on to explain, "students in the class of 2010 who reported completing a core curriculum—defined as four or more years of English, three or more years of mathematics, three or more years of natural science, and three or more years of social science and history—scored, on average, 151 points higher on the SAT than those who did not complete a core curriculum." We've known at least since Socrates that challenging, well-sequenced coursework leads to more learning. It is time for us, as a nation, to act on that knowledge and give all students the common core curriculum they need to be prepared for advanced reading and learning. □

Endnotes

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