Building Knowledge

What an Elementary School Curriculum Should Do

By Natalie Wexler

Despite billions of dollars and massive efforts on the part of thousands of highly dedicated and intelligent people over the past 25 years, the size of the test-score gap between the wealthiest and the poorest students hasn't changed.[1] Our mediocre standing on international literacy rankings is largely a reflection of how low our lowest scores are.[2] Teachers in high-poverty schools in Washington, D.C., have told me they've had students at all levels of ability, including the highest, but some of their stories were deeply disturbing.

Their high school students often lack a sense of chronology, they said. Students may confuse the Civil War and the civil rights movement. They may think Frederick Douglass and Martin Luther King Jr. were contemporaries. In a world history class studying the segregation faced by black soldiers returning to the United States after World War I, some students were under the impression that slavery still existed in 1918. In a course on the United States after the Civil War, the teacher couldn't assume that students knew what happened *before* that war, even though they had already taken a class that covered it. "You have to start with: there was a War of Independence," she said, "and this is who we won our independence from."[3]

Others told me their students don't understand the difference between a country and a continent, or between a city and a state. One kid in an SAT prep class—one of the better students, according to his teacher, who cited the fact that "he could place the United States on a world map"—was surprised by the term *South America* when he saw it on a map, apparently for the first time: How could it be called *America* if it wasn't *in* America?[4]

Another high school teacher said she's even had a few students who don't know the name of the country they live in. "They think Washington, D.C., is their country," she said.[5]

Urban school systems have been faced with the impossible task of turning ninth-graders who arrive with gaps like these into "college- and career-ready" graduates in four years—and threatened with consequences under federal law if graduation rates dip below 67 percent. For a while, the threats appeared to be working: in 2016, the national graduation rate reached an all-time high of more than 84 percent.[6] But within months, it became clear that some urban school systems had turned to subterfuges.[7] These included having students pass courses by taking far less rigorous online versions and changing attendance records. In Washington, D.C.—a city that many reformers have

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ILLUSTRATIONS BY SALLY VITSKY

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pointed to as a model, and where the graduation rate rose 20 points in six years—an investigation revealed that a full third of the 2017 graduates hadn't met requirements.[8]

These problems don't end at high school. Studies suggest that students with low test scores are less likely to pursue higher education, obtain and keep jobs, provide for their families, exercise their civic rights and responsibilities, and lead fulfilling lives.[9] Education is supposed to enable everyone to do those things. It represents our best hope for breaking the cycle of multigenerational poverty. Really, it's our *only* hope.

And it's not working. Socioeconomic inequality in the United States is on the rise.[10] Many students proudly enroll in college—the surest route to success—only to discover they're so ill-prepared they need to take remedial reading and math. The vast majority of lower-income students never manage to get that coveted degree.[11]

Knowledge Makes a Difference

In 1987, two researchers in Wisconsin, Donna Recht and Lauren Leslie, conducted an experiment that shed some light on the roots of many of the problems that afflict our education system—and especially the gap in test scores between students at the top and bottom of the socioeconomic scale. They constructed a miniature baseball field,[12] installed it in an empty classroom in a junior high school, and peopled it with four-inch wooden baseball players arranged to simulate the beginning of a game. Then they brought in 64 seventh- and eighth-grade students who had been tested both for their general reading ability and for their knowledge of baseball.

The goal was to determine to what extent a child's ability to understand a text depended on her prior knowledge of the topic. Recht and Leslie chose baseball because they figured lots of kids in junior high school who weren't great readers nevertheless knew a fair amount about the subject. Each student was asked to read a text describing half an inning of a fictional baseball game and move the wooden figures around the board to reenact the action described.

Churniak swings and hits a slow bouncing ball toward the shortstop, the passage began. *Haley comes in, fields it, and throws to first, but too late. Churniak is on first with a single, Johnson stayed on third. The next batter is Whitcomb, the Cougars' left-fielder.*

It turned out that prior knowledge of baseball made a huge difference in students' ability to understand the text—more of a difference than their supposed reading level.[13] The kids who knew little about baseball, including the "good" readers, all did poorly. And among those who knew a lot about baseball, the "good" readers and the "bad" readers all did well. In fact, the bad readers who knew a lot about baseball outperformed the good readers who didn't.

In another study, researchers read preschoolers from mixed socioeconomic backgrounds a book about birds, a subject they had determined the higher-income kids already knew more about. When they tested comprehension, the wealthier children did significantly better. But then they read a story about a subject neither group knew anything about: made-up animals called *wugs*. When prior knowledge was equalized, comprehension was essentially the same.[14] In other words, the gap in comprehension wasn't a gap in skills. It was a gap in knowledge.

The implication is clear: abstract "reading ability" is largely a mirage constructed by reading tests. A student's ability to comprehend a text will vary depending on many factors, prime among them being his familiarity with the topic. While instruction in the early grades has focused on "learning to read" rather than "reading to learn," many educators have overlooked the fact that part of learning to read is acquiring knowledge.

Research has established that one aspect of reading does need to be taught and practiced as a set of skills, much like math: decoding, the part that involves matching sounds to letters. (For more on decoding, see the article on page 4.) The problem is that the other aspect of reading—comprehension—is also being taught that way. The prevailing approach is to focus on skills and strategies such as "finding the main idea" and "making inferences," with students practicing the skills on books on random topics that have been determined to match their individual reading levels. While there's plenty of evidence that *some* instruction in *some* comprehension strategies can be helpful for *some* children, there's no reason to believe it can turn struggling readers into accomplished ones.

That's particularly true when it comes to nonfiction, which generally assumes more specialized background knowledge. To acquire the knowledge and vocabulary that will help them understand nonfiction, children need to do more than read a single book on a topic before skipping to another one while practicing how to identify text features or determine text structure. They need to stick with a topic for days or weeks, encountering the same vocabulary and concepts repeatedly so they will stick.[15]

It's not so much that particular bits of information are vital in and of themselves—although some certainly are. It's more that people need to have enough facts in their heads to have what one commentator has called "a knowledge party"[16]—a bunch of accumulated associations that will enable them to absorb, retain, and analyze new information. Education certainly shouldn't end with facts. But if it doesn't begin there, many students will never acquire the knowledge and analytical abilities they need to thrive both in school and in life.

Vocabulary Is Essential, but Not Enough

It's not that educators are unaware of the importance of knowledge and vocabulary. One frequently taught reading comprehension strategy is "activating prior knowledge." If the story is about a trip on

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an airplane, for example, the teacher might ask kids if they've ever taken one. And if a text assumes knowledge many students don't have, he might quickly supply it. But that kind of on-the-spot injection of information is unlikely to stick without reinforcement.[17]

Teachers are more likely to be aware of the need to build students' vocabulary rather than their knowledge; those gaps are more obvious, and more research has been done on the importance of vocabulary to comprehension. To be sure, it's important to focus on words that are used frequently in academic writing but are unlikely to be acquired through spoken language—words like *merchant*, *fortunate*, and *benevolent*.[18] But it's impossible to equip children with all the vocabulary they need by teaching it to them directly. During the first several years of schooling, children add eight words a day to their vocabularies, on average;[19] the only way to expand vocabulary that quickly is to expand knowledge. A single word is often just the tip of an iceberg of concepts and meanings, inseparable from the knowledge in which it is embedded. If you understand the word *oar*, for example, you're probably also familiar with the concepts of rowboats and paddling.

But building knowledge is trickier than teaching vocabulary. Teachers sometimes overestimate what children already know: I watched a class of second-graders struggle for half an hour through a text about slavery before their teacher realized they didn't understand the word *slavery*. Kindergartners in one low-income community had an average score in the fifth percentile on a vocabulary test,[20] which reflected their inability to identify pictures showing the meanings of words like *penguin*, *sewing*, or *parachute*, and educators have told me of students who don't know simple words like *behind* and *bead*.

At the same time, teachers can *underestimate* students' capabilities. In addition to limiting children to books at their supposed levels, they may explain an entire text in simple language before reading it aloud, thus depriving students of the chance to wrest meaning from complex language themselves. (For more on misconceptions about reading levels, see the article on page 13.)

"I believe what everybody believes," said one fifth-grade teacher at a high-poverty school in Nevada. "I don't mean to believe it, but it gets into you—this idea that certain learners are less capable of engaging with certain content. And I think that we've been making a lot of mistakes based in compassion for our students.... We make this great effort to smooth the road for them."

After experimenting with a text she was sure would be too challenging for her students—and being surprised by how well they did—she came to realize that she'd been doing them a disservice. "Unless they learn to navigate the bumps," she said, "we're not teaching them to be thinkers or readers."[21]

Knowledge Is Like Velcro

There are multiple reasons that children from less-educated families arrive at school with less knowledge and vocabulary than their peers from highly educated ones—many having to do

with wealth and income, which are highly correlated with levels of education. Children who live in poverty are far more likely to suffer the consequences of traumatic events that can interfere with their ability to learn.[22] Wealthier parents are better able to invest in their children;[23] that can mean anything from buying more books to paying for tutoring or extracurricular activities.

In recent years, the difference between what lower- and higher-income parents spend on their children has increased dramatically. In 1972, the wealthiest Americans were spending five times as much per child as the lowest-income families. By 2007, parents at all economic levels were spending more on their children, but the highest-income families were spending *nine* times as much.[24] As "human capital"—skills and education—has become increasingly vital to success, families in the top 20 percent have invested more heavily in ensuring their children can compete. It's become increasingly difficult for the bottom 80 percent to keep up.

Poor and working-class families are also more likely to practice "natural growth" parenting, according to sociologist Annette Lareau, allowing their children lots of unstructured time and tending to give directions rather than soliciting opinions. Middle-class and affluent families, on the other hand, generally practice "concerted cultivation": driving their kids to soccer practice and band recitals, engaging in family debates at dinnertime, and encouraging independent thinking. Each parenting style has its advantages, but the concerted cultivation kids are better equipped to do well in school.[25]

And then there's language. Children whose parents read to them frequently become familiar with the sophisticated vocabulary and syntax that appears in written rather than spoken language.[26] Talking is important too. One much-publicized study

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published in the 1990s estimated that high-income children hear 30 million more words than low-income children by age 4.[27] Recent research has called that estimate into question and focused instead on the number of "conversational turns," or back-and-forth verbal interactions, between parents and children; the more conversational turns, the better a child's language skills.[28] And—although the ubiquity of cell phones and other screens has interfered with conversational turns across the spectrum—on average, higher-income families engage in more of them.[29]

Less-educated parents are also less likely to use complex vocabulary in conversation, and teachers may not be exposing students to it either. One study found that children living in high-poverty neighborhoods get "a double dose of disadvantage" as compared to their higher-income peers: the language they hear is less sophisticated both at home and at school. While these children "may have unique linguistic strengths that serve them well in their immediate settings," they were less likely to have the language skills that would enable them to do well academically.[30]

Whatever the causes, it's clear that children with certain risk factors begin school with skills that may be almost a year behind those of their peers.[31] And the gap only widens over time.[32] The more knowledge a child starts with, the more likely she is to acquire yet more knowledge. She'll read more and understand and retain information better, because knowledge, like Velcro, sticks best to other related knowledge.

This phenomenon of snowballing knowledge accumulation by kids who start out with more—while those who start out with less acquire less—has been dubbed "the Matthew effect."[33] That's a reference to a line in the Gospel according to Matthew—"For unto every one that hath shall be given, and he shall have abundance: but from him that hath not shall be taken away even that which he hath": or, "the rich get richer and the poor get poorer." And the longer the Matthew effect is allowed to continue, the harder it is to reverse. That's why it's crucial to envelop students from less-educated families in a knowledge-building environment as early as possible.

Rather than being restricted to the simple material they can read on their own, young children need to *listen* to their teachers read more complex books aloud and engage in discussions about what they've heard—and, depending on their age, write about it.[34] Even many middle schoolers can take in far more sophisticated content, and the vocabulary that goes with it, through listening and speaking than through their own reading.[35] If teachers organize their read-alouds by topic instead of the skill-of-the-week, children have the chance to hear the same concepts and vocabulary repeatedly. Once they have a general familiarity with a topic, they can read more difficult text about it independently.

The Role of Working Memory

When we try to make sense of what we read, we rely on what cognitive scientists refer to as *working memory*, something psychology professor Daniel T. Willingham has called the *staging ground for thought*. Another definition might be *consciousness*. It's the process whereby we take in new information and combine it with the facts and procedures stored in our long-term memory. The key thing about working memory is that it has a limited capacity. And information in working memory is lost if it isn't quickly "rehearsed"—perhaps articulated or written about. By one estimate, the limit is just 15 to 30 seconds.[36]

So time is of the essence when trying to assimilate new information. If we can relate it to something we already know, it speeds up the process considerably. If we need to stop and look up every other word, or puzzle them out from context, we're far less likely to be able to understand and retain what we're reading.

Background knowledge, Willingham explains, also enables a reader to engage in something called *chunking*. Let's say the text in the 1987 baseball experiment said that the shortstop threw the ball to the second baseman, who threw the ball to the first baseman, resulting in two runners being out. The students who knew a lot about baseball could "chunk" those actions by recognizing them as a double play. But those who knew little about baseball would have to try to remember each step in the series of actions described, which occupies more space in working memory.

Scientists also use the word *schema* to describe this process. A schema is a mental framework constructed from accumulated information and experience and stored in long-term memory. When people already have a schema for a topic, new information on that topic has something it can stick to. If knowledge about baseball helps readers understand a text about baseball, it follows that knowledge about the world in general equips readers to do well on a test that covers a variety of subjects. And that's exactly what experiments have shown.[37]

There's no one right way to provide a high-quality education, and this country is too big and varied for one-size-fits-all prescriptions. But if we're equipped with a basic scientific understanding about which methods are most effective—and most likely to provide an engaging experience for kids—we should all be able to distinguish between approaches that are likely to produce the outcomes we want and those that will only lead to a heartbreaking waste of precious time. The best first step is for a school or district to adopt one of the new content-focused elementary literacy curricula that have appeared on the market—and in some cases online, for free—over the past several years.

We'll need to simultaneously pursue many other reform efforts, of course, including improving teacher training, ensuring

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that students living in poverty get the mental health and support services they need, and engaging families in their children's learning. But if we don't also give students access to knowledge of the world during elementary school, we'll never achieve the result we want: a system that equips all students to lead productive and fulfilling lives and carry out their responsibilities as members of a democratic society. ☐

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