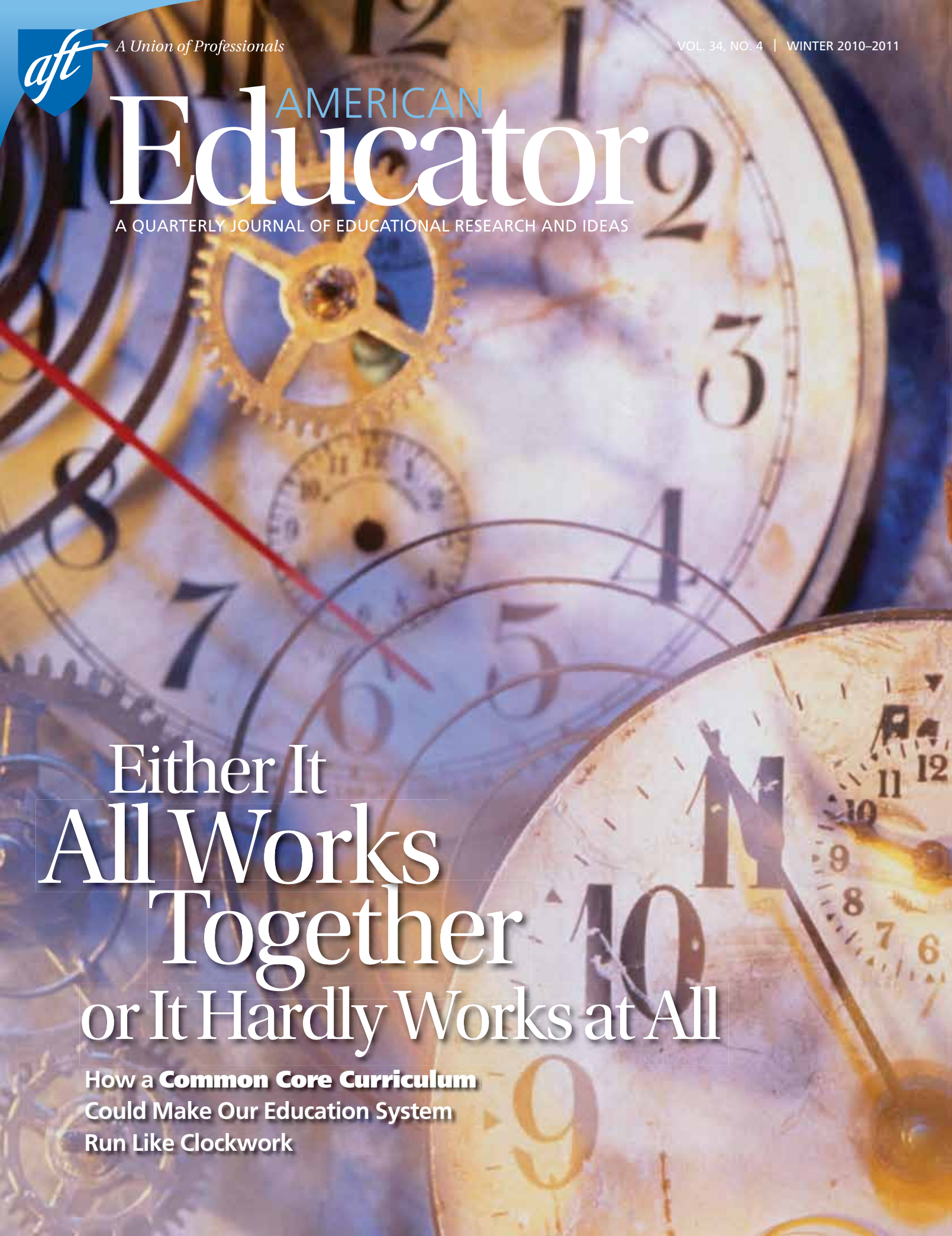
aft A Union of Professionals

VOL. 34, NO. 4 | WINTER 2010–2011

AMERICAN Educator

A QUARTERLY JOURNAL OF EDUCATIONAL RESEARCH AND IDEAS



Either It All Works Together or It Hardly Works at All

How a **Common Core Curriculum** Could Make Our Education System Run Like Clockwork

GIVE THE GIFT THAT SAVES THE DAY

In this season of hope—when you want your gifts to really matter—there's one gift you can always count on to save the day.

It will save the day when the next disaster strikes. When a neighbor's house burns down. When someone needs lifesaving blood, or the comfort of a helping hand. It will turn heartbreak into hope.

Hope. It's the gift **you** give to the American Red Cross.

Please donate today.

American Red Cross

1-800-RED CROSS
redcross.org

AMERICAN Educator
VOL. 34, NO. 4 | WINTER 2010–2011

AMERICAN EDUCATOR (USPS 008-462) is published quarterly by the American Federation of Teachers
555 New Jersey Ave. N.W.
Washington, DC 20001-2079
Phone: 202/879-4400
www.aft.org

Letters to the editor may be sent to the address above or to **amered@aft.org**.

AMERICAN EDUCATOR cannot assume responsibility for unsolicited manuscripts.

Please allow a minimum of four weeks for copyright permission requests.

Signed articles do not necessarily represent the viewpoints or policies of the AFT.

Although advertisements are screened as carefully as possible, acceptance of an advertisement does not imply AFT endorsement of the product or service.

AMERICAN EDUCATOR is mailed to all AFT teacher and higher education members as a benefit of membership. Non-AFT members may subscribe by mailing $10 per year by check or money order to the address on the left.

MEMBERS: To change your address or subscription, notify your local union treasurer.

POSTMASTER: Send address changes to AMERICAN EDUCATOR
555 New Jersey Ave. N.W.
Washington, DC 20001-2079

Periodicals postage paid at Washington, D.C., and additional mailing offices.

ADVERTISERS: Contact
Karen Dorne Media Sales
319 Harrison Ave.
Westfield, NJ 07090
Phone: 908/233-6075
Fax: 908/233-6081

Common Core Curriculum

An Idea Whose Time Has Come

School reform is, arguably, as old as public schools. But for the past three decades—since *A Nation at Risk* urged dramatic action—it has been nonstop, and not very successful. Innovations come and go; progress is made and lost; schools succeed and fail. Teachers are local heroes and national scapegoats.

Why?

Why have we, as a nation, been unable to move forward even as other nations, like Finland, Japan, Singapore, and South Korea, have come from behind and eclipsed our achievements? Reasons abound—our scandalously high rate of child poverty and its associated ills, our unfocused and inadequate teacher and principal training, and our superintendents' and policymakers' insatiable desire for new initiatives are just a few that come to mind. But of all the barriers to genuine, sustained improvement, one stands out. As a nation, we have neither asked nor answered questions of paramount importance: What is an education? What is fundamental to it? What is peripheral?

When we consider each question thoughtfully, clear answers emerge. An education is an enlightening and enriching experience that results in a body of knowledge and skill—both academic and social—that enables one to be a responsible and productive citizen. What is fundamental to an education is the specific body of knowledge and skill, and the best means of acquiring it; what is peripheral is everything else.

The reason we have fallen behind so many of our international peers is that we have been pursuing the peripheral while they have been pursuing the fundamental. While we have been dabbling in pedagogical, management, and accountability fads, they have written common core curricula—and that has made all the difference. A common core curriculum is not just a piece of paper that guides the teacher; it is a living document that guides and brings coherence to the *whole educational endeavor*.

A *curriculum* sets forth that body of knowledge and skill our children need to grow into economically productive and socially responsible citizens. A *common* curriculum—meaning one that is shared by all schools—is what binds all the different actors together; instead of going off in radically different directions and inadvertently undermining each other, teachers, administrators, parents, textbook writers, assessment developers, professors of education, and policymakers all work in concert. A common *core* curriculum—meaning one that fills roughly two-thirds of instructional time—leaves teachers ample room to build on students' interests and address local priorities.

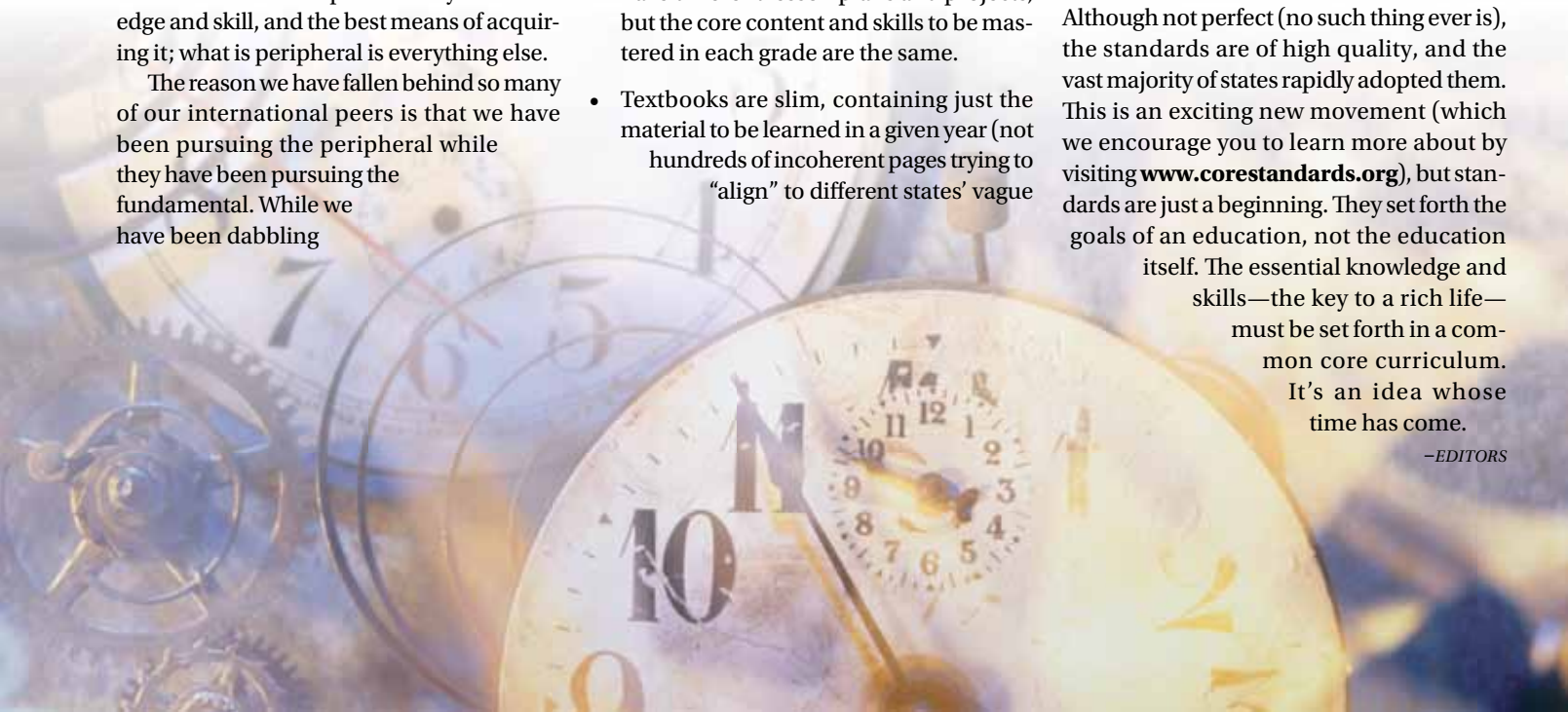
In countries with a common core curriculum, the benefits are many:

- Teachers need not guess what will be on assessments; if they teach the curriculum, their students will be prepared.
- Students who change schools are not lost, so time is not wasted on review and remediation. Their new teachers may have different lesson plans and projects, but the core content and skills to be mastered in each grade are the same.
- Textbooks are slim, containing just the material to be learned in a given year (not hundreds of incoherent pages trying to "align" to different states' vague standards and different notions of proficiency).
- Teacher preparation programs ensure that candidates have mastered the curriculum, and ways to teach it, before they become teachers.
- Teachers across the hall, across town, and (thanks to the Internet) across the country are able to collaborate on developing and refining lesson plans and other instructional materials.

These are far from all the benefits of a common core curriculum. Many more are discussed throughout this issue, but one stands out: equity. Without a common core curriculum, there can be no educational equity. True equality of opportunity may not be possible, but striving for it is, and no goal is more worthy.

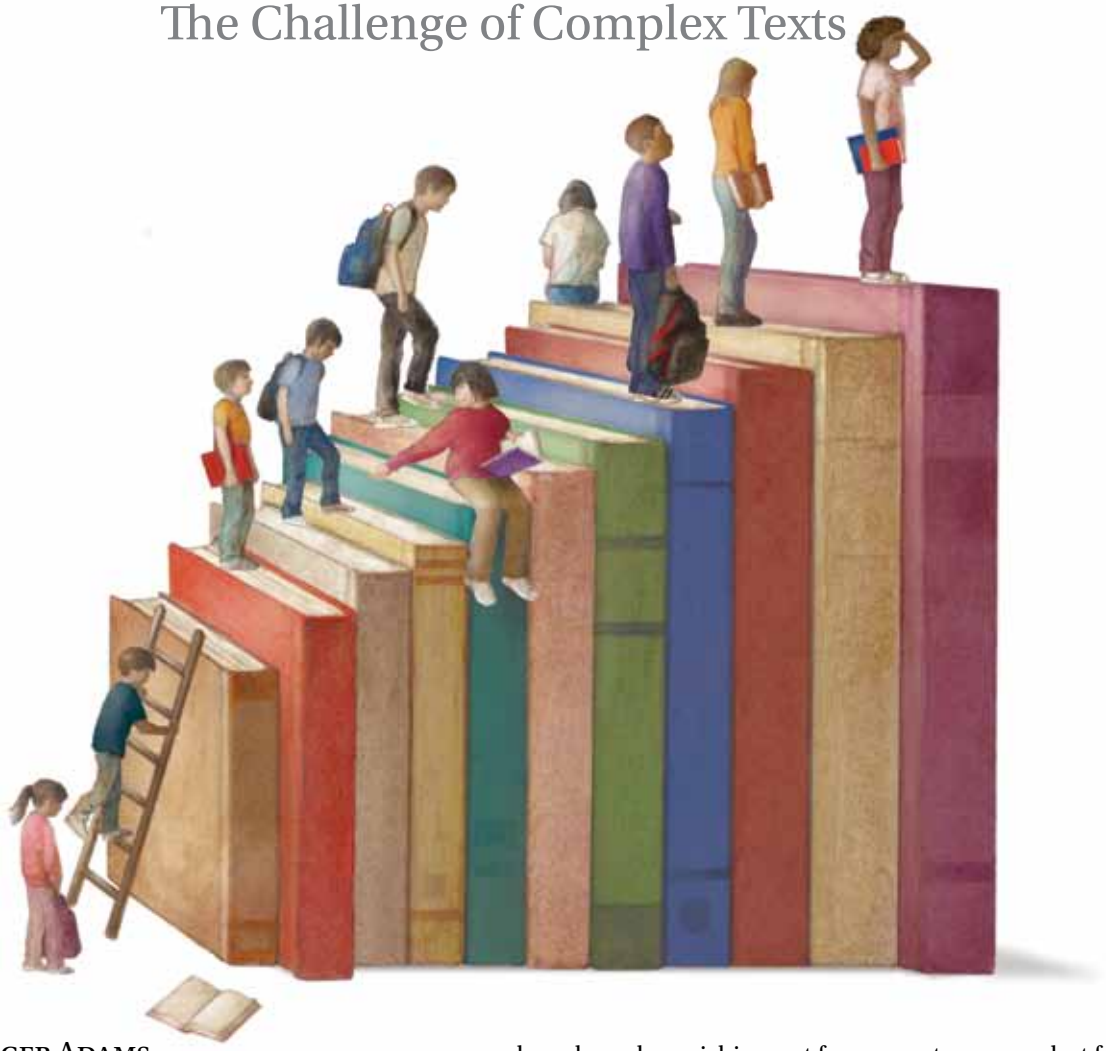
This special issue of *American Educator* comes at a special time. After decades of debate, America is on the cusp of having common academic standards. Over the past 18 months, the Common Core State Standards Initiative—a state-led, highly collaborative, voluntary effort—developed, publicly vetted, and revised English language arts and mathematics standards designed to help teachers prepare all students, regardless of where they live, for higher education and workforce training. Although not perfect (no such thing ever is), the standards are of high quality, and the vast majority of states rapidly adopted them. This is an exciting new movement (which we encourage you to learn more about by visiting **www.corestandards.org**), but standards are just a beginning. They set forth the goals of an education, not the education itself. The essential knowledge and skills—the key to a rich life—must be set forth in a common core curriculum. It's an idea whose time has come.

–EDITORS



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

Marilyn Jager Adams is a research professor in the Cognitive, Linguistic, and Psychological Sciences Department of Brown University and former chief scientist for Soliloquy Learning Inc. She is the author of numerous scholarly papers and several books, including two landmark works: Beginning to Read: Thinking and Learning about Print *and* Phonemic Awareness in Young Children. *This article is adapted with permission of the Guilford Press from "The Challenge of Advanced Texts: The Interdependence of Reading and Learning," which Adams wrote for* Reading More, Reading Better, *edited by Elfrieda H. Hiebert, copyright 2009 by Guilford Press.*

ILLUSTRATIONS BY NENAD JAKESEVIC

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.

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

In international assessments of schoolchildren, the performance of our fourth-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 on 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).

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

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

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.

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?

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

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

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.

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.

> Making textbooks easier ultimately denies students the very language, information, and modes of thought they need most to move up and on.

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.

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.

> We must organize our readings in every subject so each text bootstraps the language and knowledge needed for the next. Gradually, students will be ready for texts of greater complexity.

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.*

A great benefit of a common core curriculum is that it would drive an overhaul of the texts we give students to read, and the kinds of learning and thought we expect their reading to support.

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 30), 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 this 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

1. Catherine Gewertz, "Few Changes on SAT Posted by Class of 2010," *Education Week*, September 22, 2010.

2. Eric Gorski, "Scores on SAT College Entrance Test Hold Steady," Associated Press, September 13, 2010.

3. Sara Rimer, "Class of 2008 Matches '07 on the SAT," *New York Times*, August 26, 2008.

4. See, for example, Willard Wirtz et al., *On Further Examination: Report of the Advisory Panel on the Scholastic Aptitude Test Score Decline* (New York: College Entrance Examination Board, 1977); Tamar Lewin, "Students' Paths to Small Colleges Can Bypass SAT," *New York Times*, August 31, 2006; Jesse M. Rothstein, "College Performance Predictions and the SAT," *Journal of Econometrics* 121, no. 1–2 (2004): 297–317; and Lawrence C. Stedman, "Respecting the Evidence: The Achievement Crisis Remains Real," *Education Policy Analysis Archives* 4, no. 7 (1996): 1–31.

5. Andrew Sum, Irwin Kirsch, and Robert Taggart, *The Twin Challenges of Mediocrity and Inequality: Literacy in the U.S. from an International Perspective* (Princeton, NJ: Educational Testing Service, 2002).

6. Stephen Provasnik, Patrick Gonzales, and David Miller, *U.S. Performance across International Assessments of Student Achievement: Special Supplement to the Condition of Education 2009* (Washington, DC: National Center for Education Statistics, 2009).

7. Bobby D. Rampey, Gloria S. Dion, and Patricia L. Donahue, *NAEP 2008 Trends in Academic Progress* (Washington, DC: National Center for Education Statistics, 2009).

8. Marilyn Seastrom, Lee Hoffman, Chris Chapman, and Robert Stillwell, *The Averaged Freshman Graduation Rate for Public High Schools from the Common Core of Data: School Years 2001–02 and 2002–03* (Washington, DC: National Center for Education Statistics, 2005).

9. ACT, *Reading between the Lines: What the ACT Reveals about College Readiness in Reading* (Iowa City, IA: ACT, 2006).

10. Wirtz et al., *On Further Examination*; and William W. Turnbull, *Student Change, Program Change: Why the SAT Scores Kept Falling* (New York: College Entrance Examination Board, 1985).

11. Wirtz et al., *On Further Examination*.

12. Albert E. Beaton, Thomas L. Hilton, and William B. Schrader, *Changes in the Verbal Abilities of High School Seniors, College Entrants, and SAT Candidates between 1960 and 1972* (New York: College Entrance Examination Board, 1977).

13. Lawrence C. Stedman, "The Condition of Education: Why School Reformers Are on the Right Track," *Phi Delta Kappan* 75, no. 3 (1993): 215–225.

14. Turnbull, *Student Change, Program Change*.

15. Jeanne S. Chall, Sue S. Conard, and Susan H. Harris, *An Analysis of Textbooks in Relation to Declining SAT Scores* (New York: College Entrance Examination Board, 1977).

16. Donald P. Hayes, Loreen T. Wolfer, and Michael F. Wolfe, "Schoolbook Simplification and Its Relation to the Decline in SAT-Verbal Scores," *American Educational Research Journal* 33, no. 2 (1996): 489–508.

17. Hayes, Wolfer, and Wolfe, "Schoolbook Simplification," 497.

18. Hayes, Wolfer, and Wolfe, "Schoolbook Simplification," 489–508.

19. Donald P. Hayes, "The Growing Inaccessibility of Science," *Nature* 356, no. 6372 (1992): 739–740.

20. Douglas Biber, "Are There Linguistic Consequences of Literacy? Comparing the Potentials of Language Use in Speech and Writing," in *The Cambridge Handbook of Literacy*, ed. David R. Olson and Nancy Torrance (Cambridge: Cambridge University Press, 2009), 75–91.

21. Donald P. Hayes and Margaret G. Ahrens, "Vocabulary Simplification for Children: A Special Case of 'Motherese'?" *Journal of Child Language* 15, no. 2 (1988): 395–410.

22. Emmett A. Betts, *Foundations of Reading Instruction* (New York: American Book Company, 1946); Ronald P. Carver, "Percentage of Unknown Vocabulary Words in Text as a Function of the Relative Difficulty of the Text: Implications for Instruction," *Journal of Reading Behavior* 26, no. 4 (1994): 413–437; Marcella Hu Hsueh-chao and Paul Nation, "Unknown Vocabulary Density and Reading Comprehension," *Reading in a Foreign Language* 13, no. 1 (2000): 403–430; and Batia Laufer, "What Percentage of Text-Lexis Is Essential for Comprehension?" in *Special Language: From Humans Thinking to Thinking Machines*, ed. Christer Lauren and Marianne Nordman (Clevedon, UK: Multilingual Matters, 1988), 316–323.

23. George K. Zipf, *The Psycho-Biology of Language* (Boston: Houghton Mifflin, 1935).

24. *The American Heritage School Dictionary* (Boston: Houghton Mifflin, 1977).

25. John B. Carroll, Peter Davies, and Barry Richman, *The American Heritage Word Frequency Book* (Boston: Houghton Mifflin, 1971).

26. William E. Nagy and Richard C. Anderson, "How Many Words Are There in Printed School English?" *Reading Research Quarterly* 19, no. 3 (1984): 304–330.

27. Steven A. Stahl and Marilyn M. Fairbanks, "The Effects of Vocabulary Instruction: A Model-Based Meta-Analysis," *Review of Educational Research* 56, no. 1 (1986): 72–110.

28. William E. Nagy, Patricia A. Herman, and Richard C. Anderson, "Learning Words from Context," *Reading Research Quarterly* 20, no. 2 (1985): 233–253.

29. William E. Nagy, Richard C. Anderson, and Patricia A. Herman, "Learning Word Meanings from Context during Normal Reading," *American Educational Research Journal* 24, no. 2 (1987): 237–270.

30. Richard C. Anderson, Paul T. Wilson, and Linda G. Fielding, "Growth in Reading and How Children Spend Their Time Outside of School," *Reading Research Quarterly* 23, no. 3 (1988): 285–303; and Nagy, Anderson, and Herman, "Learning Word Meanings."

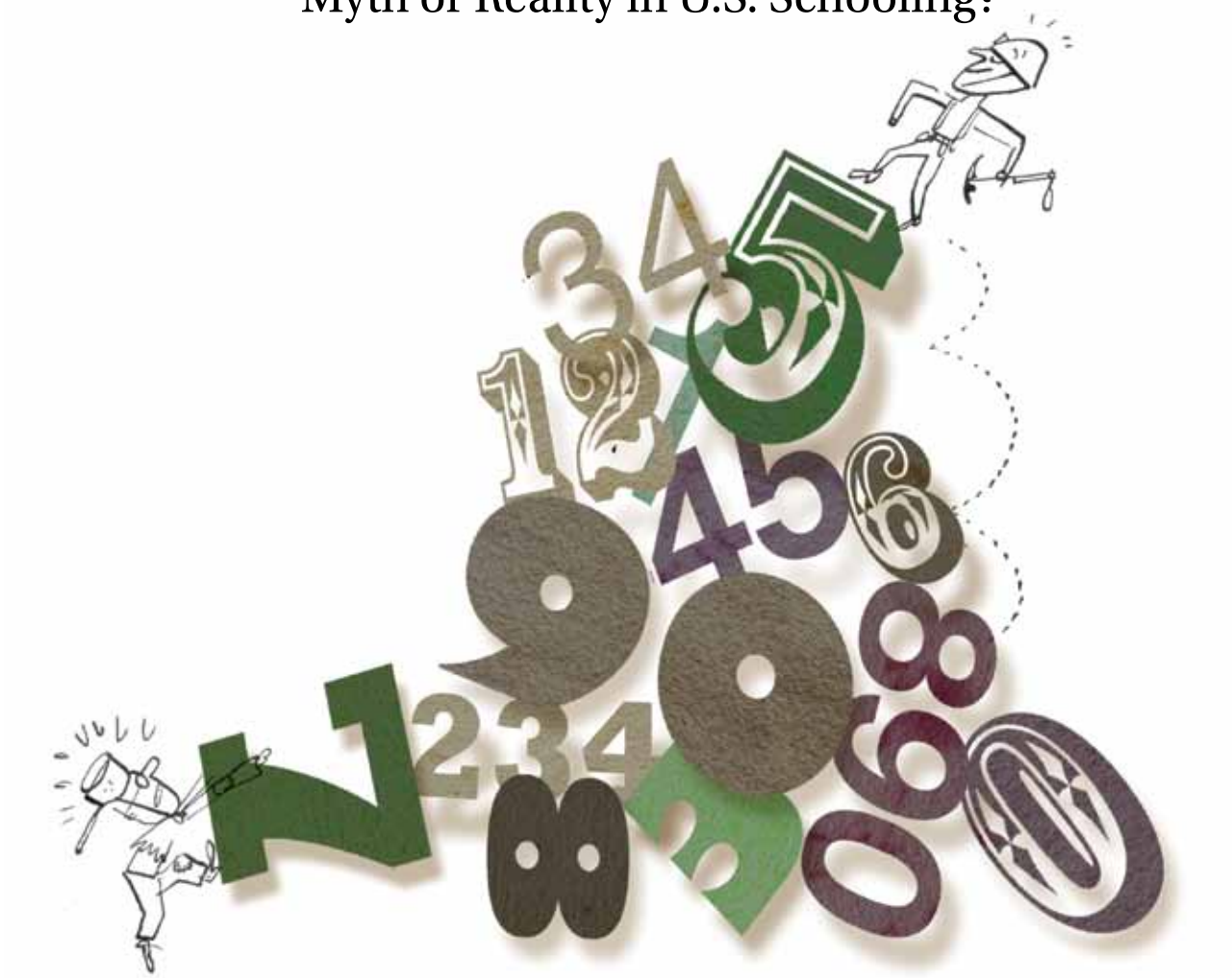
31. Thomas K. Landauer, "Learning and Representing Verbal Meaning: The Latent Semantic Analysis Theory," *Current Directions in Psychological Science* 7, no. 5 (1998): 161–164; and Thomas K. Landauer and Susan T. Dumais, "A Solution to Plato's Problem: The Latent Semantic Analysis Theory of Acquisition, Induction, and Representation of Knowledge," *Psychological Review* 104, no. 2 (1997): 211–240.

32. Anne E. Cunningham and Keith E. Stanovich, "Early Reading Acquisition and Its Relation to Reading Experience and Ability 10 Years Later," *Developmental Psychology* 33, no. 6 (1997): 934–945; and Harry L. Gradman and Edith Hanania, "Language Learning Background Factors and ESL Proficiency," *Modern Language Journal* 75, no. 1 (1991): 39–51.

(Continued on page 53)

Equality of Educational Opportunity

Myth or Reality in U.S. Schooling?



By William H. Schmidt, Leland S. Cogan, and Curtis C. McKnight

Public schooling is often regarded as "the great equalizer" in American society. For more than 100 years, so the story goes, children all across the country have had an equal opportunity to master the three Rs: reading, writing, and arithmetic. As a result, any student willing to work hard has the chance to go as far as his or her talent allows, regardless of family origin or socioeconomic status.

This assumption regarding opportunity and emphasis on individual talent and effort seems to be a natural offshoot of the rugged individualism and self-reliance that are so much a part of the fabled American character. We have long celebrated our cowboys, entrepreneurs, and standout athletes—but we have also long ignored those who have not succeeded. When success is individual, so is failure. It must result from a lack of effort, talent, motivation, application, or perseverance, not a lack of opportunity. Right?

Not according to our research. Defining educational equality in the most basic, foundational way imaginable—equal coverage of core academic content—we've found that America's schools are far from being the equalizers we, as a nation, want them to be.

So what? Does it really matter that "the great equalizer" is a myth? To our way of thinking, it does. First, as researchers, we believe it is always important to question our assumptions—and that goes for our national assumptions about equality and individualism as well as our personal assumptions. Second, the more

William H. Schmidt is a university distinguished professor at Michigan State University as well as codirector of the Education Policy Center, where Leland S. Cogan is a senior researcher. Schmidt is also codirector of the U.S.-China Center for Research on Educational Excellence and codirector of the National Science Foundation–funded MSU PROM/SE project. Previously, he served as national research coordinator and executive director of the U.S. National Center, which oversaw U.S. participation in the Third International Mathematics and Science Study (TIMSS). Curtis C. McKnight is a professor of mathematics at the University of Oklahoma. *For a more complete reference and description of the work in this article, please refer to an article just accepted for publication in a future issue of the* American Journal of Education.

ILLUSTRATIONS BY SERGE BLOCH

we study schools, the more inequity we see. While other researchers have tackled important issues like disparities in teachers' qualifications and in classroom resources, we have focused on the basic question of what mathematics topics are taught. We have been disturbed to see that whether a student is even exposed to a topic depends on where he or she lives. Third, we find that those who don't question basic assumptions draw tragic, unsupportable conclusions. Take, for example, the controversial book *The Bell Curve*,[1] in which Richard J. Herrnstein and Charles Murray wrongly argued that unequal educational outcomes can *only* be explained by the unfortunate but unavoidable distribution of inherited abilities that relegate some students to the low end of the intelligence distribution. As we will show, unequal educational outcomes are clearly related to unequal educational opportunities.

In this article, we explore the extent to which students in different schools and districts have an equal opportunity to learn mathematics. Specifically, we discuss research on (1) the amount of variability in content coverage in eighth grade across 13 districts (or consortia of districts) and 9 states, and (2) the variation in mathematics courses offered by high schools in 18 districts spread across 2 states. We knew we would find some variability in terms of content coverage and course offerings, so our real question had to do with the nature and extent of the differences and whether they seemed to matter in terms of student achievement. Simply put, sometimes differences yield equivalent results, but sometimes differences make a difference.

In the United States, research like this is necessary because our educational system is not one system, but a disparate set of roughly 15,000 school districts distributed among 50 states and the District of Columbia. While states, with varying degrees of focus, rigor, and coherence,[2] have developed academic standards, local districts still maintain *de facto* control of their curriculum—some have written their own standards, some have written their own curriculum, some mandate the use of selected textbooks, and some leave all such decisions up to the schools. Even in states that control the range of textbooks that may be adopted by districts, the districts themselves always control (or choose to allow schools to control) which content within those textbooks will be covered or emphasized.

Leaving the choice of content coverage to individual districts and schools (with very few state controls) makes it possible and even *probable* that schools cannot be the equalizers we would like them to be. With roughly 15,000 school systems, American children simply are not likely to have equal educational opportunities as defined at the most basic level of equivalent content coverage. It is therefore highly questionable and even unfair to assume that differences in student achievement and learning are the sole result of differences in individual students' efforts and abilities. To assert that those who do not achieve at prescribed levels fail to do so because they cannot, or do not, take advantage of the opportunities afforded them is, at best, to mistake part of the story for the whole. The whole story also must consider the radically different opportunities provided by different schools, districts, and states, and acknowledge that which opportunities are provided is determined by socioeconomic factors, housing patterns, community structures, parental decisions, and many other factors that have one thing in common—they are all beyond the control of individual students.

In the research literature, the concept we are exploring is called the "opportunity to learn" (OTL). While it has been defined in many ways, to our way of thinking the specific mathematics content is the defining element of an educational opportunity in mathematics. Of course, many things can and do affect how that content is delivered. But our research focuses on equivalent content coverage because this allows a more precise definition of "equal educational opportunity" as it relates to learning. Without equality in content coverage, there can be no equality in opportunity related to that content, no matter the equality of other resources provided. Ultimately, learning specific content is the goal. The mathematics itself is at the heart of the opportunity to learn and thus is a very salient component in examining equality of educational opportunity. In addition, it is a factor that policymakers can address.

In all, our research aims to answer one question: do all the different mathematics content roads fairly and equally lead to the same high-quality educational outcomes? As we will explain below, they do not.

I. Inequality in Eighth Grade

For our research on eighth-grade mathematics, we examined the extent to which students in different districts and states had the same opportunity to learn specific mathematics topics and how that was related to their academic achievement.* To do this, we analyzed a unique† set of data from a study that replicated the 1995 Third International Mathematics and Science Study (TIMSS)—the most extensive multinational comparative study ever attempted. In addition to assessing student achievement in over 40 countries, the 1995 TIMSS collected a great deal of other data, including detailed information on the mathematics curricula and classroom content coverage.

The replica study had many components or substudies. The part we are concerned with here is the TIMSS 1999 Benchmarking Study, which was designed to compare—or benchmark—U.S. states and districts against the countries that participated in the 1999 TIMSS.‡ As shown in Table 1 (on page 14), for the benchmarking study we worked with 13 school districts (or consortia of districts) and 9 states, all of which chose (and paid) to participate as we gathered extensive data on their eighth-grade mathematics content coverage and student achievement. A total of 36,654 students in these states and districts took the 1999 TIMSS test and provided a wide array of demographic and socioeconomic data, including age, gender, racial/ethnic group, whether English was spoken in the home, what education-related posses-

†The data gathered in the TIMSS 1999 Benchmarking Study are unique in two important ways. First, it is exceedingly rare to have common measures across all research sites (i.e., states and districts) for the variables of interest. Often researchers must make assumptions about the comparability of measurements in order to build a usable data set. Here, we have consistently measured the mathematics content as it was implemented in the classroom, the mathematics performance of the students in those classrooms, as well as individual indicators of students' socioeconomic status. Second, we have these common measures from a group of districts, district consortia, and states that, while not a random sample, are likely to be nationally representative. This affords a completely unique opportunity to examine the relationship between mathematics content coverage and achievement at the district level while controlling for students' socioeconomic status.

‡Although the United States did participate in the 1995 TIMSS, the resulting information was for the United States as a whole and could not provide much insight into what was happening in states and districts.

*For a technical and thorough discussion of this study, please see **www.epc.msu.edu/publications/report/Equality%20of%20educational%20opportunity.pdf**.

Table 1
Districts and States That Participated in the 1999 TIMSS Benchmarking Study

Education Jurisdiction	# of Classes	# of Students
Academy, CO	49	1,233
Chicago, IL	49	1,059
DE Science Coalition	58	1,268
First in the World Consortium, IL	38	748
Guilford County, NC	50	1,018
Jersey City, NJ	48	1,004
MI Invitational Group	46	901
Miami-Dade, FL	54	1,226
Montgomery County, MD	50	1,155
Naperville, IL	53	1,212
Rochester City, NY	51	966
SMART Consortium, OH	53	1,096
SW Pennsylvania Math/Science Coalition	84	1,538
Idaho	115	1,847
Illinois	228	4,679
Indiana	100	2,044
Michigan	117	2,623
Missouri	114	1,924
Oregon	122	1,886
Pennsylvania	171	3,236
South Carolina	99	2,008
Texas	112	1,983
Total	*1,861*	*36,654*

sions were in the home (e.g., computer, dictionary, and number of books), parental education level, number of adults in the home, etc.* In addition, the students' 1,861 mathematics teachers filled out a questionnaire on the topics they had covered during the school year.

The mathematics topics listed in the teacher questionnaire were based on the mathematics content framework[3] developed for the 1995 TIMSS; it consists of 44 specific mathematics topics (e.g., common fractions, percentages, 3-D geometry, etc.) that cover the full range of K–12 mathematics. On the questionnaire, teachers indicated whether they had taught each topic for 1 to 5 periods, more than 5 periods, or not at all.

Gathering all these data was simply the first step. We didn't just want to know what was being taught in our states and districts; we wanted some sense of how each topic fit into the scope and sequence of mathematics schooling across the grades from an international perspective (hence the benchmarking idea). Using the 1995 TIMSS multinational mathematics curriculum data, we developed an International Grade Placement (IGP) topic index to indicate the grade in which the most countries typically emphasized each topic.† We say "emphasized" each topic because we realize that topics are often taught in multiple grades. Nonetheless, we were able to identify the grade in which each topic typically received its greatest instructional focus. Each topic was assigned a value between 1 and 12 indicating an international consensus regarding the grade in which the topic should be emphasized. Table 2 (below) lists a few selected topics and shows their IGP values. For example, the first topic, whole numbers, has an IGP value of 1.7. This means that most countries give whole numbers their greatest instructional focus toward the end of first grade.

Given the hierarchical nature of school mathematics (in which addition must come before multiplication, fractions before exponents, etc.), we think it is reasonable to assume that topics receiving their main instructional focus in later grades in most countries are more difficult than those receiving their main focus in earlier grades. Thus, our IGP topic values provide an indication of some international consensus regarding the rigor and appropriate grade level of each topic.

With this IGP topic index and the teacher questionnaire, we developed a measure of students' opportunity to learn mathematics in each of the 1,861 eighth-grade classrooms we were studying. Our opportunity-to-learn measure took into account which topics were taught, how much time was devoted to each topic, and what the IGP value was for each topic. Using this measure, we assigned each classroom a value between 1 and 12 to indicate the average international grade level of all the topics taught (weighted by instructional time). In effect, our opportunity-to-learn measure assigns an International Grade Placement value to each classroom. Averaging all the IGP values for the classrooms in a district, we can then determine each district's IGP

Table 2
International Grade Placement (IGP) for Selected Topics from the Mathematics Teacher Questionnaire

Selected Mathematics Topics	IGP
Fractions and Number Sense	
Whole numbers—including place value, factoring, and operations	1.7
Understanding and representing common fractions	4.4
Computations with common fractions	4.4
Simple computations with negative numbers	6.6
Square roots (of perfect squares less than 144), small integer exponents	7.5
Geometry	
Congruence and similarity	8.4
Symmetry and transformations (reflection and rotation)	7.1
Algebra	
Simple algebraic expressions	7
Representing situations algebraically; formulas	7

*In our discussion, we make use of the internationally scaled total test score in eighth-grade mathematics for the replica of TIMSS (TIMSS-R).

†This empirically derived indication of topic rigor has been found to have strong face validity as well as construct validity.[4]

value. And, we can do the same for each state.

As can be seen from Table 2, a classroom that spent a lot of time on fractions (a fourth-grade topic, according to our IGP topic index), and very little time on algebraic expressions or formulas (seventh-grade topics), might have an IGP classroom value of a little more than 5, indicating a content mix that in most TIMSS countries is taught during the fifth grade. In contrast, a classroom that spent the vast majority of its time on the geometry and algebra topics listed in Table 2 would have a value of about 7 to 8, because almost all time was spent on seventh- and eighth-grade topics.

Students' Opportunity to Learn Mathematics

As we briefly explained in the introduction, school districts have far more influence than states over what content gets taught. So, our discussion focuses on our district-level findings. As for the state-level findings, suffice it to say that we did all the same analyses with our state-level data as with our district-level data, and the findings were very similar. Although variation among states on all opportunity-to-learn indicators was less than that among the districts, this did not alter the pattern or significance of the observed relationships and did not change our conclusions. (The lesser variation at the state level is to be expected as states represent a broader combination of many districts.)

Internationally, the focus of eighth grade for all students in virtually all of the TIMSS countries—except the United States—is algebra and geometry. In our study, not a single district had all of its students focusing mainly on algebra and geometry. This is reflected in the districts' IGP values, which ranged from 6.0 to 6.9. This means that in some districts, eighth-grade teachers (on average) were teaching content typically found at the end of fifth or the beginning of sixth grade internationally, while in other districts, the content came closer to that found at the end of sixth or the beginning of seventh grade.[†] Not only is this a lot of variation in students' opportunity to learn mathematics, it indicates that *all students* were being shortchanged since none of the districts were focusing on eighth-grade (or even seventh-grade) content.

Figure 1
Scatterplot of Percent of Students' Parents with a College or University Degree and Mean Achievement for 13 Districts

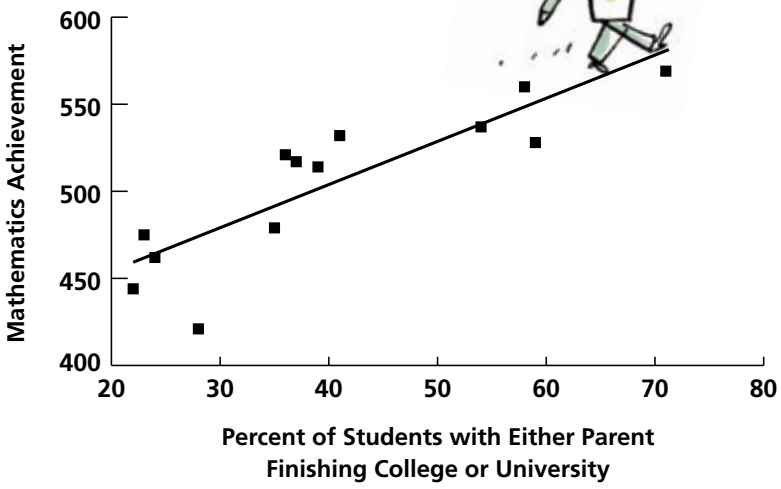
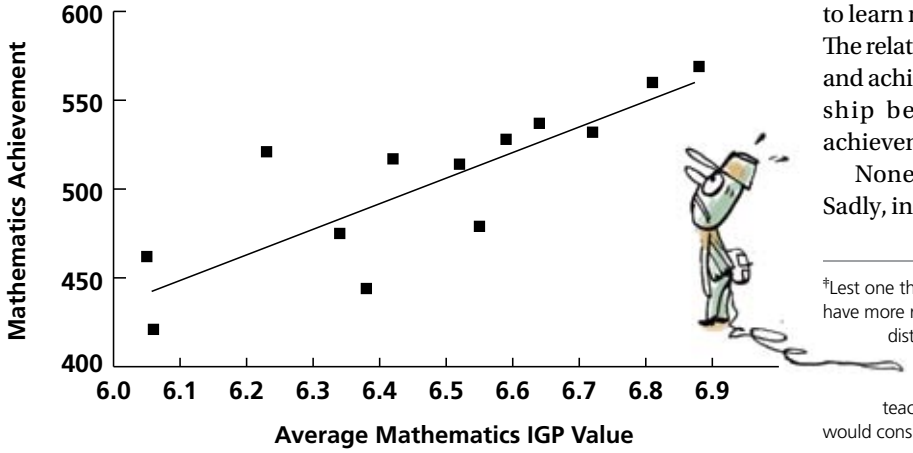


Figure 2
Scatterplot of Districts' Average Mathematics IGP Value and Mean Achievement for 13 Districts



Of course the real question is, does any of this variation in mathematics learning opportunities make any difference in students' achievement? We addressed this issue through a set of analyses that we briefly describe here.

On the basis of decades of findings that students with higher socioeconomic status typically have higher scores on achievement tests,[5] some researchers and policymakers have hypothesized that socioeconomic status has a *greater* impact on achievement than does schooling itself. Some have even gone so far as to conclude that schooling doesn't really matter. Indeed, among our districts, we found a strong relationship between students' mathematics achievement as measured by their TIMSS scores, and the percentage of students' parents who had a college or university degree (a common indicator of socioeconomic status). This relationship is depicted in Figure 1 (top left).

Does this mean that all the differences we found in students' opportunity to learn mathematics are not important? Not at all. Figure 2 (bottom left) shows the relationship between our 13 districts' TIMSS mathematics scores and their IGP values. Clearly, as IGP value—and, therefore, a more demanding opportunity to learn mathematics—increased, so did achievement. The relationship between students' opportunity to learn and achievement was every bit as strong as the relationship between their socioeconomic status and achievement.

Nonetheless, we still do not have the whole story. Sadly, in our "land of opportunity," students' socioeco-

[†]Lest one think that such variation has decreased in recent years, we also have more recent evidence from a study we are doing with over 60 districts from Michigan and Ohio. Based on a more precise measure, the opportunity to learn in eighth grade varied even more, ranging from 5.5 to 7.5. Still, no district was teaching predominantly what most other high-achieving countries would consider eighth-grade content.

nomic status is related not only to their achievement, but also to their opportunity to learn. As shown in Figure 3 (bottom left), across the districts we found a strong relationship between the percentage of students' parents with a college or university degree and the district IGP value. This means that the more parents with a college or university degree in a district, the higher the IGP value and the higher the average mathematics achievement. The estimated increase in opportunity to learn was not trivial: the mathematics content coverage in districts in which around 60 percent of students' parents had a college or university degree was about one-half of a grade level ahead of districts in which less than 30 percent of students' parents had a college or university degree.

These results have profound policy implications. The realization of the fundamental vision of public schools as the great equalizers rests on the assumption that content coverage is essentially the same for all children. If some are not taught essential mathematics topics in their schooling, why would we believe they will learn mathematics as well as those who are exposed to all essential content?

How can we think about these interrelationships between student achievement, content coverage, and socioeconomic status? Figure 4 (right) provides a simple model that hypothesizes how both socioeconomic status and curricular content play a role in mathematics achievement at the district level.

Finding that socioeconomic status and opportunity to learn are both independently related to achievement is not surprising; these relationships have been studied previously in various ways with various types of data—both national and international, but not at the district level. In fact, we found such relationships when we analyzed the international TIMSS data.[6] However, what is unique to the United States is the strong estimated relationship between socioeconomic status and opportunity to learn. When high-quality national or regional standards (and/or curricula) are in place, as they typically are in other countries, that linkage is essentially minimized if not eliminated.[7]

As a result of its strong correlation between socioeconomic status and opportunity to learn, *the United States has a particularly strong relationship between socioeconomic status and achievement*. Using the 1995 TIMSS data, we found that the correlation between socioeconomic status and achievement was stronger in the United States than in 32 (out of 40) other countries. This raises the issue of equality, given that the lower the income-level composition of a district, the more likely it is that content coverage will be less demanding and that the average mathematics achievement of eighth-graders will be lower. Most other countries have clear, detailed national or regional academic standards and/or curricula that define content coverage and therefore minimize the influence of socioeconomic status on opportunity to learn.[8]

The implication of our conceptual model is that by adopting focused, rigorous, coherent, and common content-coverage frameworks, the United States could minimize the impact of socioeconomic status on content coverage—a goal toward which virtually all our international economic peers are making progress.

Hopefully, the recently developed Common Core State Standards (see **www.corestandards.org**) will help the United States offer students greater equity in their opportunity to learn. But for now, a burning question remains: which is more important to student learning, socioeconomic status or opportunity to learn? An easy question to pose, but not a simple one to answer due to the complex nature of our U.S. education system. To disentangle these relationships, we analyzed the relationship between socioeconomic status, IGP value, and achievement at the classroom and district levels.

At the classroom level, controlling for socioeconomic status and students' prior achievement, the IGP value was statistically significantly related to achievement (actually, residual gain in achievement), as were our measures of socioeconomic status. For a one grade-level increase in IGP value, the increase in

Figure 4
Conceptual Model Relating Socioeconomic Status, Opportunity to Learn, and Achievement in the United States

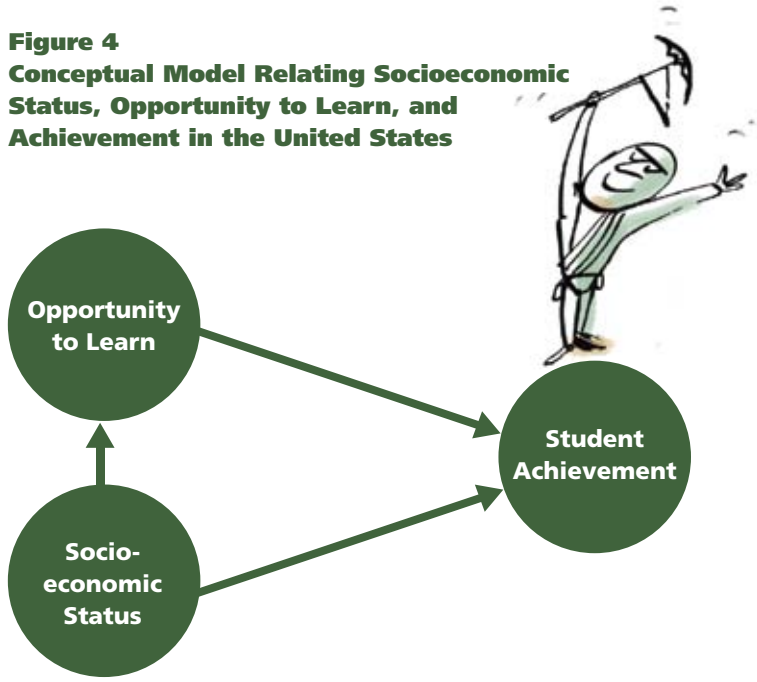
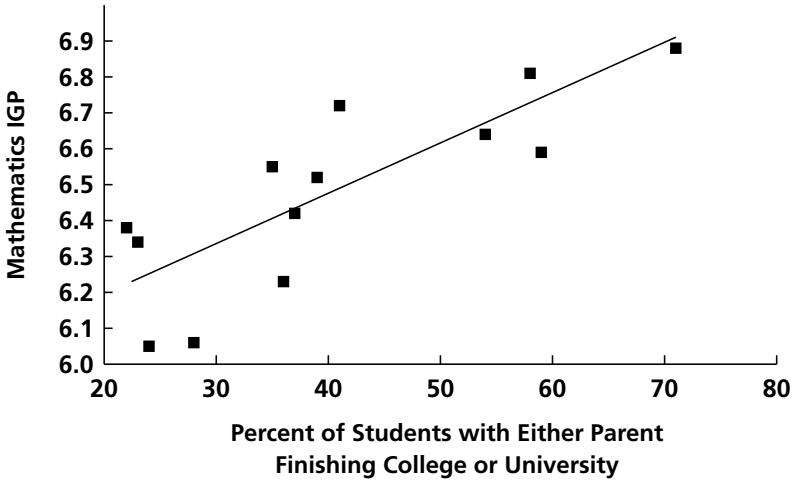


Figure 3
Scatterplot of Percent of Students' Parents with a College or University Degree and Average Mathematics IGP Value for 13 Districts



mean achievement at the classroom level was .15 of a standard deviation. That's like a student in the 50th percentile moving to the 56th percentile.

The impact of district-level opportunity to learn on student achievement (controlling for student- and classroom-level variables) was approximately one-third of a standard deviation. So, our best estimate indicates that an increase of one grade-level in IGP value at the district level would move a student from the 50th percentile to roughly the 65th percentile on mathematics achievement. Thus, the answer to our question is that student achievement is significantly related to socioeconomic status, but, *having controlled for this at all three levels (student, classroom, and district), both classroom- and district-level opportunity to learn is also significantly related to student achievement.* Variation in students' opportunity to learn comes from both the classroom and the district. This is both good and bad news. It is good news because opportunity to learn is something districts and teachers can change. The bad news is that districts seem to persist in providing less rigorous content to students with lower socioeconomic status.

The bottom line is that equality of educational opportunity, where opportunity is defined in terms of content coverage, does not exist within or across districts. Just as problematic is our initial finding: for these districts, the typical content covered in these eighth-grade classrooms is considered sixth-grade content internationally. *Other TIMSS countries are typically two grade levels ahead of the United States in terms of the rigor of their curricula.* Fortunately, our research suggests that the achievement of U.S. students would likely increase substantially if we would make our mathematics content more demanding.

Up to this point, we've dealt with the consequences of content variation at the middle school (eighth-grade) level. Do these differences in opportunity to learn persist once students move to high school? We address this in the next section.

II. Inequality in High School

As part of a research and development project called Promoting Rigorous Outcomes in Mathematics and Science Education (PROM/SE),* we have worked with nearly 60 school districts in two states, Michigan and Ohio (because the work is ongoing, we will not identify the districts). To explore the extent to which high school students have an equal opportunity to learn mathematics, we examined the transcripts of 14,000 seniors in 30 high schools in 18 of our PROM/SE districts. As we explain below, we found a shocking number of mathematics courses and dramatic differences in students' course taking.

Much of the variation we found is the result of the pervasive use of high school tracking (i.e., offering different levels of the same course, such as Basic Algebra, Algebra, and Honors Algebra). While tracking today is typically not as rigid as it used to be (with students in the college, general, or vocational track for all their courses), it still has an impact on students' opportunity to learn.

Most schools and districts in the United States track students because they believe it optimizes students' achievement. Advocates of tracking argue that this type of curricular differentiation facilitates teaching and learning, as it matches students' current knowledge and ability levels to the most suitable curriculum. Tracking theory contends that some students would struggle immensely in a high-level curriculum, while a low-level curriculum would confine others.

Most research on secondary school mathematics tracking, however, has found that it tends to adversely impact students in low-level courses compared with their peers in high-level courses. Students in low-tracked mathematics courses are less likely to expect to go to college, less likely to actually attend college (even after controlling for students' postsecondary expectations), and have lower self-images.[9] Perhaps most salient, though, is that many studies have found that mathematics tracking tends to exacerbate achievement inequalities between high- and low-tracked students.[10]

In order for multiple mathematics tracks to exist, the school must offer multiple mathematics courses. A school that offers four mathematics courses—one corresponding to each grade level—and requires all of its students to take these courses, only offers one possible sequence of courses and thus one track. However, this is highly uncommon. Schools typically offer more than four mathematics courses—often many more—and allow students to choose from numerous possible sequences of courses. These sequences can, and often do, vary by the number of courses taken, the order in which courses are taken, and the types of courses taken.

> Not only do we have great variability across districts, but by international standards, our eighth-grade students are exposed to sixth-grade content.

To find out just how much variability there was in our 30 high schools and 18 districts, we began by counting the number of distinct mathematics courses offered. We treated each new course title as a different course, even in cases like "Formal Geometry" and "Geometry," or "Applied Algebra" and "Algebra I." Previous research has shown that the covered content in two courses with a similar title can vary wildly.[11] We therefore find it more prudent to assume that if schools choose to give courses different titles, then it is most likely that the content is different, at least to some extent.

In all, we found 270 different mathematics course titles, including 39 focused on mathematics below algebra, 11 on beginning algebra, 9 on geometry, and 9 on advanced algebra. Here are a few examples:

- **Below Beginning Algebra**: Fundamental Math, Technical Math, Transitional Math I, Contemporary Math I, Practical Math, Math Junior, Intervention Math I, Final Math Topics, Corrective Math, Alternative Math, Life Skills Math, Vocational Math

*To learn about this project, see **www.promse.msu.edu**.

- **Beginning Algebra**: Applied Algebra, Algebra I, Algebra I Honors, Introductory Algebra, First Year Fundamental Algebra
- **Geometry**: Elementary Geometry, Plane Geometry B, Geometry, Informal Geometry, Fundamental Geometry
- **Advanced Algebra**: Algebra II General, Enriched Algebra II, Integrated Algebra II, Advanced Algebra II, Essentials of Algebra II, Algebra II

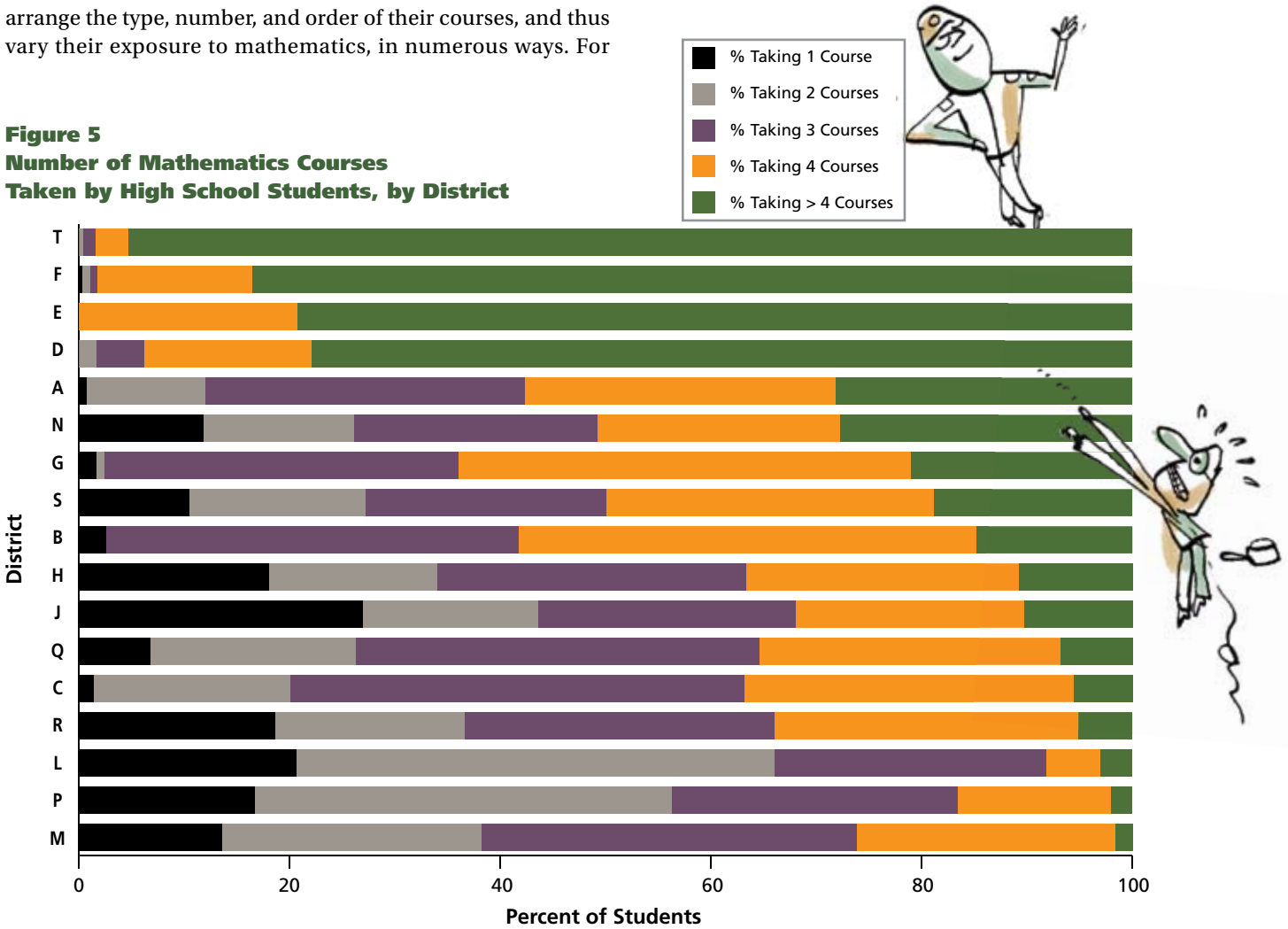
Of course, what really matters is not all 270 courses, but which courses are offered in each of the 18 districts. We focus on the district rather than the school because the district sets curriculum policies. Of course, high schools in the same district may not offer the exact same number or types of mathematics courses, but we found the variation among schools in the same district to be quite small. In contrast, we found that the number of mathematics courses offered by each district varied considerably. If a district were to offer only one course for each mathematics content category (e.g., beginning algebra, geometry, precalculus, etc.), then there would be fewer than 10 courses offered. Looking across our 18 districts, the number of courses ranges from a low of 10 to a high of 58, with most districts offering close to 30 mathematics courses.

All these courses means that students in each school can arrange the type, number, and order of their courses, and thus vary their exposure to mathematics, in numerous ways. For example, two students in the same school may take substantively different sequences of courses—such as Basic Math, then Algebra, then Geometry; versus Geometry, then Advanced Algebra, then Precalculus—*and* take different versions of these courses—such as Elementary Geometry versus Honors Geometry.

We have, until this point, focused on the total number of courses offered, seeing large variation in both the number and the types of courses. The variation in actual courses taken, however, is not as large as it could be. Many students take similar courses. About 40 percent of the students in our study took Algebra I, Geometry, and Algebra II. Nevertheless, variation in course taking remains significant.

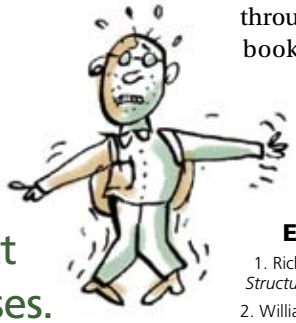
One particular way that students' mathematics course taking varies is in the number of courses they take. As shown in Figure 5 (below), we examined the number of mathematics courses taken by each of the 14,000 seniors in our 18 districts. We were dismayed to find that in half the districts, anywhere from 10 to 27 percent of students took just one mathematics course in high school. (In the other districts, anywhere from 0 to 7 percent took just one course.) At the other extreme, in four districts the vast majority of students took four or more mathematics courses. Across districts, variation was common. Most districts had students who took anywhere from one to four or more courses.*

Figure 5
Number of Mathematics Courses Taken by High School Students, by District



Although we began this study well aware that high school students have options in selecting their mathematics courses, we were startled by the differences across districts. Students may attend high school in the same district, but as they graduate there is little commonality in the type or amount of mathematics to which they have been exposed. We do not believe all high school students should take the same courses, but we do believe there should be a high degree of overlap across programs for most students. We certainly do not see any reason for 270 mathematics courses, or for 25 percent of students in one district to take just one mathematics course while more than 90 percent of students in another district take more than four courses.

We do not see any reason for 25 percent of students in one district to take one mathematics course while more than 90 percent of students in another district take more than four courses.



Most nations endorse the idea that, as public policy, *all* their children should have equal educational opportunities. For the vast majority of 1995 TIMSS countries, intended mathematics content coverage was indeed the same for all their students through what we would call middle school. Even in countries that appear to be creating different tracks, the reality is that basic content is covered by all, with advanced students studying the same topics more deeply.[12] The associated differences among student performance on the TIMSS achievement test were thus far more a matter of individual student ability and effort, combined with differences in teacher quality, than a matter of public policy that supported or even encouraged regional or local differences in students' opportunity to learn.

Sadly, this is not the case in the United States. Not only do we have great variability across districts in eighth grade and high school, but by international standards, our eighth-grade students are exposed to sixth-grade mathematics content. Differences in mathematics achievement are *not* simply the result of differences in student ability and effort, but also matters of chance or social factors such as poverty and housing patterns that influence where a student happens to attend school. There's just no escaping that less opportunity to learn challenging mathematics corresponds to lower achievement.

Though we wish it weren't so, the United States *cannot* be considered a country of educational equality, providing equal educational opportunities to *all* students. This lack of equality in content coverage is not merely an issue for the poor or minorities. Rather, any student in the United States can be disadvantaged simply because of where he or she attends school. In school mathematics at least, the playing field for students is not level. For all students—the lucky few and the unlucky many—educational opportunity depends on factors that cannot be wholly overcome by student ability and effort.

As a nation, we must act to correct these inequities. The solution is not as easy as simply making sweeping changes in course content, but improvement is possible. Although the research we presented here is limited to eighth grade and high school, we suspect changes would need to be made from preschool through high school in mathematics content coverage, textbooks, teacher training, and professional development. Without such changes, the inequality in opportunity to learn mathematics will continue to epitomize the worst sort of playing field: how it tilts depends on where one stands. □

*No doubt, some of the course titles indicated a one-semester course such as Algebra A and Algebra B. However, such instances would not substantially alter our conclusions.

Endnotes

1. Richard J. Herrnstein and Charles Murray, *The Bell Curve: Intelligence and Class Structure in American Life* (New York: Free Press, 1994).

2. William H. Schmidt, "What's Missing from Math Standards? Focus, Rigor, and Coherence," *American Educator* 32, no. 1 (Spring 2008): 22–24.

3. David F. Robitaille, William H. Schmidt, Senta Raizen, Curtis McKnight, Edward Britton, and Cynthia Nicol, *Curriculum Frameworks for Mathematics and Science* (Vancouver: Pacific Educational Press, 1993).

4. Achieve, *Do Graduation Tests Measure Up? A Closer Look at State High School Exit Exams* (Washington, DC: Achieve, 2004).

5. James S. Coleman, Ernest Q. Campbell, Carol J. Hobson, James McPartland, Alexander M. Mood, Frederic D. Weinfeld, and Robert L. York, *Equality of Educational Opportunity* (Washington, DC: National Center for Educational Statistics, 1966).

6. William H. Schmidt, Curtis C. McKnight, Richard T. Houang, HsingChi Wang, David E. Wiley, Leland S. Cogan, and Richard G. Wolfe, *Why Schools Matter: A Cross-National Comparison of Curriculum and Learning* (San Francisco: Jossey-Bass, 2001).

7. Schmidt et al., *Why Schools Matter*, chapter 4.

8. Schmidt et al., *Why Schools Matter*, chapter 4.

9. Karl L. Alexander, Martha Cook, and Edward L. McDill, "Curriculum Tracking and Educational Stratification: Some Further Evidence," *American Sociological Review* 43, no. 1 (1978): 47–66; Karl L. Alexander and Martha A. Cook, "Curricula and Coursework: A Surprise Ending to a Familiar Story," *American Sociological Review* 47, no. 5 (1982): 626–640; Karl L. Alexander and Bruce K. Eckland, "School Experience and Status Attainment," in *Adolescence in the Life Cycle: Psychological Change and Social Context*, ed. Sigmund D. Dragastin and Glen H. Elder Jr. (Washington, DC: Hemisphere, 1975), 171–210; Karl L. Alexander and Edward L. McDill, "Selection and Allocation within Schools: Some Causes and Consequences of Curriculum Placement," *American Sociological Review* 41, no. 6 (1976): 963–980; Jeannie Oakes, *Keeping Track: How Schools Structure Inequality* (New Haven, CT: Yale University Press, 1985); James E. Rosenbaum, "Track Misperceptions and Frustrated College Plans: An Analysis of the Effects of Tracks and Track Perceptions in the National Longitudinal Survey," *Sociology of Education* 53, no. 2 (1980): 74–88; and Beth E. Vanfossen, James D. Jones, and Joan Z. Spade, "Curriculum Tracking and Status Maintenance," *Sociology of Education* 60, no. 2 (1987): 104–122.

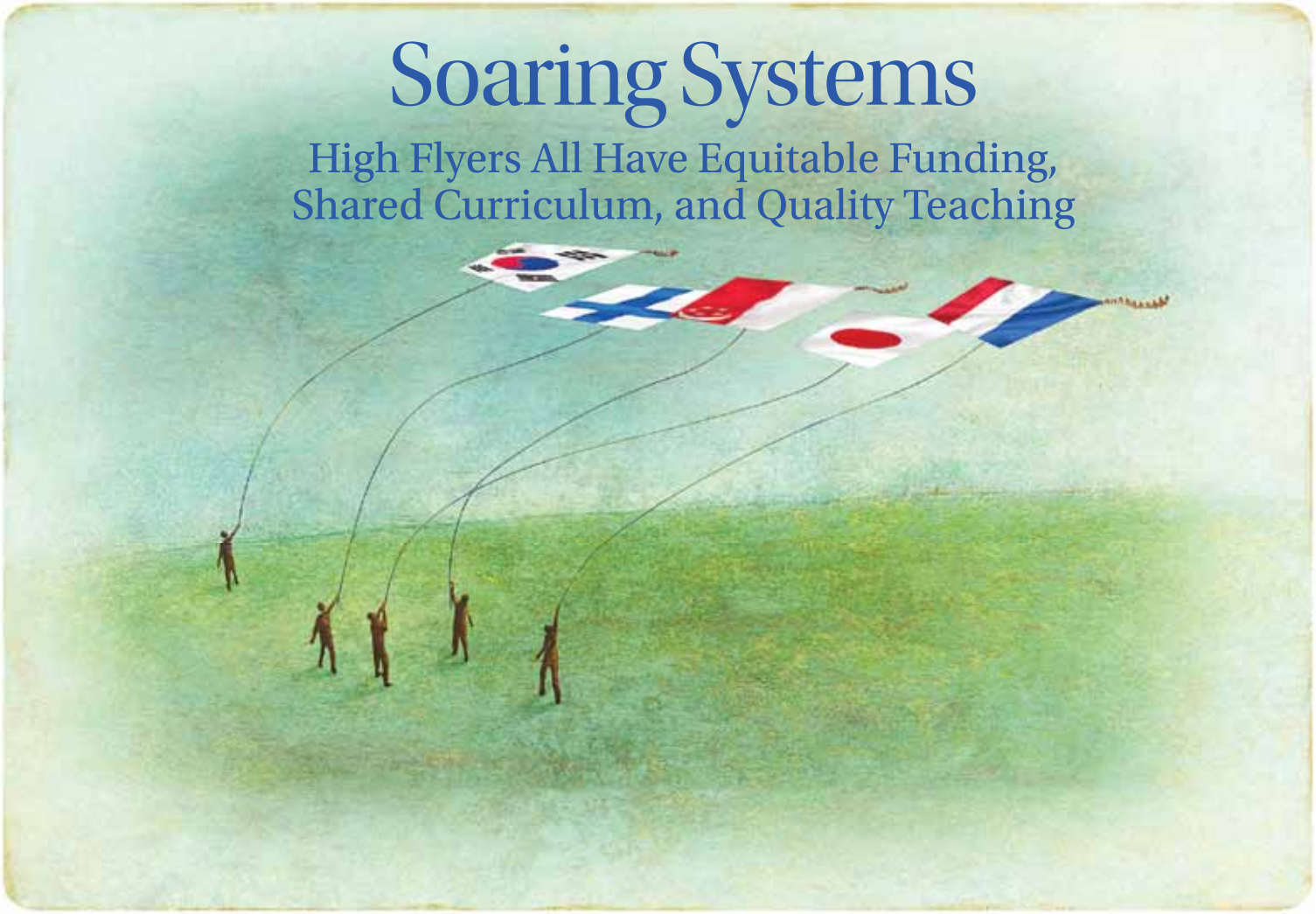
10. Adam Gamoran, "The Stratification of High School Learning Opportunities," *Sociology of Education* 60, no. 3 (1987): 135–155; Adam Gamoran and Robert D. Mare, "Secondary School Tracking and Educational Inequality: Compensation, Reinforcement, or Neutrality?" *American Journal of Sociology* 94 (1989): 1146–1183; Adam Gamoran, Andrew C. Porter, John Smithson, and Paula A. White, "Upgrading High School Mathematics Instruction: Improving Learning Opportunities for Low-Achieving, Low-Income Youth," *Educational Evaluation and Policy Analysis* 19, no. 4 (1997): 325–338; Maureen T. Hallinan and Warren Kubitschek, "Curriculum Differentiation and High School Achievement," *Social Psychology of Education* 3 (1999): 41–62; Thomas B. Hoffer, "Middle School Ability Grouping and Student Achievement in Science and Mathematics," *Educational Evaluation and Policy Analysis* 14, no. 3 (1992): 205–227; Xin Ma, "A Longitudinal Assessment of Antecedent Course Work in Mathematics and Subsequent Mathematical Attainment," *Journal of Educational Research* 94, no. 1 (2000): 16–28; Barbara Schneider, Christopher B. Swanson, and Catherine Riegle-Crumb, "Opportunities for Learning: Course Sequences and Positional Advantages," *Social Psychology of Education* 2 (1998): 25–53; and David Lee Stevenson, Kathryn S. Schiller, and Barbara Schneider, "Sequences of Opportunities for Learning," *Sociology of Education* 67 (1994): 187–198.

11. Leland S. Cogan, William H. Schmidt, and David E. Wiley, "Who Takes What Math and in Which Track? Using TIMSS to Characterize U.S. Students' Eighth-Grade Mathematics Learning Opportunities," *Educational Evaluation and Policy Analysis* 23, no. 4 (2001): 323–341.

12. Schmidt et al., *Why Schools Matter*, chapter 4.

Soaring Systems

High Flyers All Have Equitable Funding, Shared Curriculum, and Quality Teaching



> I said to my children, "I'm going to work and do everything that I can do to see that you get a good education. I don't ever want you to forget that there are millions of God's children who will not and cannot get a good education, and I don't want you feeling that you are better than they are. For you will never be what you ought to be until they are what they ought to be."
>
> –Martin Luther King, Jr.[1]

By Linda Darling-Hammond

Now more than ever, high-quality education for all is a public good that is essential for the good of the public. As the fate of individuals and nations is increasingly interdependent, the quest for access to an equitable, empowering education for all people has become a critical issue for the American nation as a whole. No society can thrive in a technological, knowledge-based economy by depriving large segments of its population of learning. But at a time when three-quarters of the fastest-growing occupations require postsecondary education, just over one-third of our young people receive a college degree.[2] Meanwhile, in many European and Asian nations, more than half of young people are becoming college graduates. At a time when high school dropouts are unlikely to secure any job at all, our high school graduation rate—stuck at about 70 percent—has dropped from first in the world to the bottom half of industrialized nations. At a time when children of color comprise a majority in most urban districts, and will be the majority in the nation as a whole by 2025,[3] we face pernicious achievement gaps that fuel inequality, shortchanging our young people and our nation.

Recent analyses of data prepared for school equity cases in more than 20 states have found that on every tangible measure—from qualified teachers and reasonable class sizes, to adequate textbooks, computers, facilities, and curriculum offerings—schools serving large numbers of students of color have significantly fewer resources than schools serving more affluent, white students.[4] Many such schools are so severely overcrowded that they run a multitrack schedule with a shortened school day and school year, lack basic textbooks and materials, do not offer the courses students would need to be eligible for college, and are staffed by a parade of untrained, inexperienced, and temporary teachers.[5]

Although many U.S. educators and civil rights advocates have

Linda Darling-Hammond is the Charles E. Ducommun Professor of Education at Stanford University, where she is codirector of the Stanford Center for Opportunity Policy in Education and the founding director of the School Redesign Network. She is a former president of the American Educational Research Association and a member of the National Academy of Education.

ILLUSTRATIONS BY MICHAEL WOLOSCHINOW

fought for higher quality and more equitable education over many years—in battles for desegregation, school finance reform, and equitable treatment of students within schools—progress has been stymied in many states over the last two decades as segregation has worsened, and disparities have grown. While students in the highest-achieving states and districts in the United States do as well as their peers in high-achieving nations, our continuing comfort with profound inequality is the Achilles' heel of American education.

These disparities have come to appear inevitable in the United States; however, they are *not* the norm in developed nations around the world, which fund their education systems centrally and equally, with additional resources often going to the schools where students' needs are greater. These more equitable investments made by high-achieving nations are also steadier and more focused on critical elements of the system: the quality of teachers and teaching, the development of curriculum and assessments that encourage ambitious learning by both students and teachers, and the design of schools as learning organizations that support continuous reflection and improvement. With the exception of a few states with enlightened long-term leadership, the United States, by contrast, has failed to maintain focused investments in any of these essential elements.

The result is that the United States is standing still while more focused and steadfast nations move rapidly ahead. Our inertia is not due to a lack of handwringing or high-blown rhetoric. In 1983, *A Nation at Risk* decried a "rising tide of mediocrity" in education and called for sweeping reforms. In 1989, then-President George H. W. Bush and the 50 governors announced a set of national goals that included ranking first in the world in mathematics and science by the year 2000. However, by 2006, on the Programme for International Student Assessment (PISA), a test conducted by the Organisation for Economic Co-operation and Development (OECD), the United States ranked 35th out of 40 developed countries in mathematics, sandwiched between Azerbaijan and Croatia, and 29th out of 40 developed countries in science, between Latvia and Lithuania.[6] The results were only slightly better in 2009, when the United States ranked 31st in mathematics, significantly below the OECD average, and 23rd in science.[7]

Learning from Others

One wonders what we might accomplish as a nation if we could finally set aside what appears to be our de facto commitment to inequality, so profoundly at odds with our rhetoric of equity, and put the millions of dollars spent continually arguing and litigating into building a high-quality education system for all children. To imagine how that might be done, one can look at nations that started with very little and purposefully built highly productive and equitable systems, sometimes almost from scratch, in the space of only two to three decades.

Let's briefly look at three very different nations—Finland, Singapore, and South Korea—that built strong education systems, nearly from the ground up. None of these nations was succeeding educationally in the 1970s, when the United States was the unquestioned education leader in the world. All created productive *teaching and learning systems* by expanding access while investing purposefully in ambitious educational goals using strategic approaches to build teaching capacity.

I use the term "teaching and learning system" advisedly to describe a set of elements that, when well designed and connected, reliably support all students in their learning. These elements ensure that students routinely encounter well-prepared teachers who work in concert around a thoughtful, high-quality curriculum, supported by appropriate materials and assessments. These elements also help students, teachers, leaders, and the system as a whole continue to learn and improve.

While none of these countries lacks problems and challenges, each has created a much more consistently high-quality education system for all of its students than has the United States. And while no system from afar can be transported wholesale into another context, there is much to learn from the experiences of those who have addressed problems we encounter. A sage person once noted that, although it is useful to learn from one's own mistakes and experiences, it is even wiser to learn from those of others.

Disparities appear inevitable in the United States; however, developed nations around the world fund education centrally and equally.

Although Finland, Singapore, and South Korea are very different from one another culturally and historically, all three have made startling improvements in their education systems over the last 30 years. Their investments have catapulted them from the bottom to the top of international rankings in student achievement and attainment, graduating more than 90 percent of their young people from high school and sending large majorities through college, far more than in the much wealthier United States. Their strategies also have much in common. All three:

- *Fund schools adequately and equitably*, and add incentives for teaching in high-need schools. All three nations have built their education systems on a strong egalitarian ethos, explicitly confronting and addressing potential sources of inequality. In South Korea, for example, a wide range of incentives is available to induce teachers to serve in rural areas or in urban schools with disadvantaged students. In addition to earning bonus points toward promotion, incentives for equitable distribution of teachers include smaller class sizes, less in-class teaching time, additional stipends, and opportunities to choose later teaching appointments.[8] The end result is a highly qualified, experienced, and stable teaching force in all schools, providing a foundation for strong student learning.
- *Organize teaching around national standards and a core curriculum* that focus on higher-order thinking, inquiry, and problem solving through rigorous academic content. Working from lean national curriculum guides that have recommended

assessment criteria, teachers collaborate to develop curriculum units and lessons at the school level, and develop school-based performance assessments—which include research projects, science investigations, and technology applications—to evaluate student learning. In Singapore, these are increasingly part of the examination system. In Finland, the assessments are primarily local but are guided by the national curriculum, which emphasizes students' abilities to reflect on, evaluate, and manage their own learning. Unlike in the United States, narrowing the curriculum has not been an issue. Take South Korea: it devotes the large majority of instructional time in every grade to a liberal arts curriculum that includes social studies, science, physical education, music, fine arts, moral education, foreign language (English), practical arts, and a range of extracurricular activities and electives.[9] Curriculum offerings are similarly comprehensive in Singapore and Finland.

- *Eliminated examination systems that had once tracked students* into different middle schools and restricted access to high school. Since adopting national curriculum guidelines, these nations have been committed to helping all students master the same essential skills and content until the beginning of high school—not to devising watered-down versions for some students.

- *Use assessments that require in-depth knowledge of content and higher-order skills*. All three countries have matriculation exams for admission to college. These are the only external examinations in Finland and South Korea. In Singapore, examinations are given in the sixth and ninth grades as well as at the end of high school. These exams have open-ended questions that require deep content knowledge, critical analysis, and writing. Although the matriculation exams are not used to determine high school graduation, they are taken by nearly all students and they set a high bar for high school coursework. In Finland, where there are no external standardized tests used to rank students or schools, most teacher feedback to students is in narrative form, emphasizing descriptions of their learning progress and areas for growth.[10] Like the National Assessment of Educational Progress in the United States, Finland uses a centrally developed assessment given to samples of students at the end of the second and ninth grades to inform curriculum and school investments. The focus of these open-ended assessments is to provide information to support learning and problem solving, not to allocate sanctions and punishments.

- *Invest in strong teacher education* programs that recruit top students, completely subsidize their extensive training programs, and pay them a stipend while they learn to teach. In all three nations, teacher education programs were overhauled to increase teachers' pedagogical knowledge and skills, on top of a deep mastery of the content areas they will teach. Finnish teachers' preparation includes at least a full year of clinical experience in a model school associated with a university. Within these model schools, student teachers participate in problem-solving groups, a common feature in Finnish schools. All teachers are trained in research methods so that they can "contribute to an increase of the problem-solving capacity of the education system."[11] Their problem-solving groups engage in a cycle of planning, action, and reflection/evaluation that is reinforced throughout teacher education and is a model for what teachers will plan for their own students, who are expected to engage in similar kinds of research and inquiry in their own studies.

- *Pay salaries that are equitable* across schools and competitive with other careers, generally comparable to those of engineers. Teachers are viewed as professionally prepared and are well respected. Working conditions are supportive, including substantial participation in decision making about curriculum, instruction, assessment, and professional development.

> In the United States, enormous energy is devoted to discussions of the achievement gap. Much less attention is paid to the opportunity gap.

- *Support ongoing teacher learning* by ensuring mentoring for beginning teachers and providing 15 to 25 hours a week for all teachers to plan collaboratively and engage in analyses of student learning, lesson study, action research, and observations of one another's classrooms, which help them continually improve their practice. All three nations have incentives for teachers to engage in research on practice, and all three fund ongoing professional development opportunities in collaboration with universities and other schools.

- *Pursue consistent, long-term reforms* by setting goals for expanding, equalizing, and improving the education system and by steadily implementing these goals, making thoughtful investments in a high-quality educator workforce and in school curriculum and teaching resources that build the underpinnings for success. This has been made possible in part by the fact that these systems are managed by professional ministries of education, which are substantially buffered from shifting political winds. Frequent evaluations of schools and the system as a whole have helped guide reforms. In each nation, persistence and commitment to core values have paid off handsomely, as all three are ranked in the very top tier of countries on international assessments and have among the most equitable outcomes in the world.

All three nations have undertaken these elements in a systemic fashion, rather than pouring energy into a potpourri of innovations and then changing course every few years, as has often been the

case in many communities in the United States, especially in large cities. And while these three small nations—each comparable in size to a midsize U.S. state—have conducted this work from a national level, similar strategies have been successfully employed at the state or provincial level in high-scoring Australia, Canada, and New Zealand, and regions such as Hong Kong and Shanghai in China. They demonstrate how it is possible to build a *system* in which students are routinely taught by well-prepared teachers who are given time to collaboratively reflect on and refine the curriculum, supported by appropriate materials and assessments that foster learning for students, teachers, and schools alike.

Core Content and Key Skills for All

In the United States, enormous energy is devoted to discussions of the achievement gap. Much less attention, however, is paid to the opportunity gap—the accumulated differences in access to key educational resources that support learning at home and at school. These key resources include high-quality curriculum, good educational materials, expert teachers, personalized attention, and plentiful information resources.

In contrast, nations around the world are transforming their school systems to eliminate opportunity gaps; they are expanding educational access to more and more of their people, and they are revising curriculum, instruction, and assessment to meet the demands of the knowledge economy. Today, there is very little curriculum differentiation until high school in the education offerings for students in high-achieving jurisdictions, such as Finland, Hong Kong, Singapore, and South Korea, which have sought, as part of their reforms, to equalize access to a common, intellectually ambitious curriculum.[12] In the last two years of high school, there is often differentiation of courses by interest, aptitude, and aspirations, but all courses of study offer high-quality options for later education and careers. By comparison, countries like France that have continued their tradition of sorting students much earlier are, like the United States, lagging in international assessments.

This is not surprising, as a substantial body of research over the last 40 years has found that (1) the combination of teacher and curriculum quality explains most of a school's contribution to achievement, and (2) access to a rich curriculum is a more powerful determinant of achievement than initial achievement levels. That is, when students of similar backgrounds and initial achievement levels are exposed to more or less challenging curriculum material, those given the richer curriculum ultimately outperform those given the less challenging curriculum.[13]

These efforts to reduce tracking have been supported by social policies that reduce childhood poverty and allow students to start school on a level playing field, and that give their teachers much better training and much more non-instructional time to plan and collaborate. In addition, over time, as all children are exposed to similar high-quality lessons, the variance in their knowledge and skills decreases. Ensuring access to a more common curriculum supports greater equity, and ultimately makes teaching all students easier.

Finland provides an excellent example. Although there was a sizable achievement gap among students in the 1970s, strongly correlated to socioeconomic status, this gap has been progressively reduced as a result of curriculum reforms starting in the 1980s—and it has continued to grow smaller and smaller in the 2000, 2003, and 2006 PISA assessments. By 2006, Finland's between-school variance on the PISA science scale was only 5 percent, whereas the average between-school variance in other OECD nations was about 33 percent.[14] In 2009, Finland had the lowest between-school variance of any OECD country on the PISA reading scale; at 7.7 percent, it was dramatically lower than the OECD average of 41.7 percent.[15] This small variability is true even in schools in Helsinki and elsewhere that receive large numbers of previously less well-educated immigrants from Africa and the Middle East. (Large between-school variation is generally related to social inequality, including both the differences in achievement across neighborhoods differentiated by wealth, and the extent to which schools are funded and organized to reduce or expand inequalities.)

High-achieving nations have sought, as part of their reforms, to equalize access to a common, intellectually ambitious curriculum.

Today's expectation that schools will enable all students, rather than a small minority, to learn challenging skills to high levels creates an entirely new mission for schools. Instead of merely "covering the curriculum" or "getting through the book," this new mission requires that schools substantially enrich the intellectual opportunities they offer while meeting the diverse needs of students. This demands not only more skillful teaching, but also a coherent curriculum that engages students in learning essential concepts in ways that develop strong thinking skills.

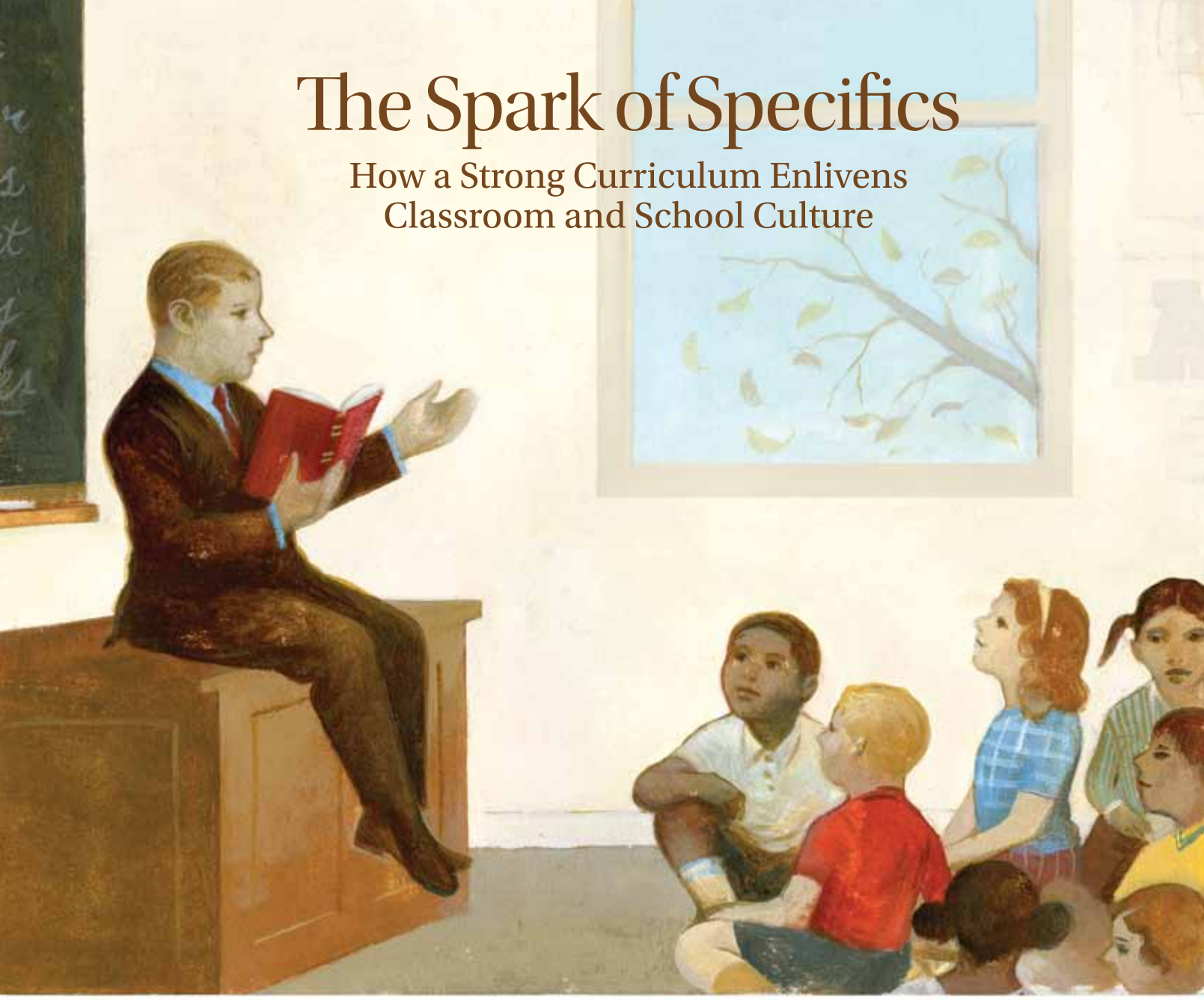
It is imperative that America close the achievement gap among its children by addressing the yawning opportunity gap. Given the critical importance of education for individual and societal success in the flat world we now inhabit, inequality in the provision of education is an antiquated tradition the United States can no longer afford. If "no child left behind" is to be anything more than empty rhetoric, we will need a policy strategy that creates a rich and challenging curriculum for all students, and supports it with thoughtful assessments, access to knowledgeable, well-supported teachers, and equal access to school resources.

Smart, equitable investments are not only the right thing to do, they will, in the long run, save far more than they cost. The savings

(Continued on page 53)

The Spark of Specifics

How a Strong Curriculum Enlivens Classroom and School Culture



ILLUSTRATIONS BY GERARD DuBOIS

By Diana Senechal

In Lewis Carroll's *Through the Looking-Glass*, the Red Queen boasts, referring to a nearby hill, "*I* could show you hills, in comparison with which you'd call that a valley." Alice objects, "A hill *ca'n't* be a valley, you know. That would be nonsense—" The Red Queen replies that she has "heard nonsense, compared with which that would be as sensible as a dictionary!"[1]

As a teacher, I have found curriculum to be both valley and hill at once, and at least as sensible as a dictionary. Curriculum is a valley in that it is often controversial; when you propose a common (i.e., shared) curriculum, things come toppling down from all sides. Policymakers and the public often object to a common curriculum because it includes this and excludes that; teachers often fear that such a curriculum will constrain their teaching. And yet, a curriculum is a hilltop; it gives us a view of everything around it: the subjects that should be taught, the shape and sequence of topics, the ultimate goals for students, the adequacy of textbooks and teacher training, the nature and content of assessments, the soundness of policies, and so on. Climbing from valley to hill is arduous, but once we establish what we are teaching, many things come clear, and the view is exhilarating at times.

A strong curriculum brings clarity to a school's endeavor; it has

Diana Senechal taught English and theater for four years in the New York City public schools; she has a PhD in Slavic languages and literatures from Yale. Her translations of the Lithuanian poetry of Tomas Venclova have been published in two books, Winter Dialogue *and* The Junction*, as well as numerous literary journals. In 2009, she served on the English Language Arts Work Team for the Common Core State Standards Initiative. Her education writing has appeared in* Education Week*, the* American Educational History Journal*,* The Core Knowledge Blog*,* Joanne Jacobs*,* GothamSchools*, and the* Washington Post*'s* The Answer Sheet*. She is currently writing a book on the loss of solitude in schools and culture.*

practical, intellectual, and philosophical benefits. It gives shape to the subjects, helps ensure consistency within and among schools, makes room for first-rate books and tests, and leaves teachers room for professional judgment and creativity. It can be a gift to a community as well as a school; it can become the foundation for a school's cultural life. It is never perfect, but that is part of its vitality. It challenges us to think through it and beyond it. It does not solve a school's problems, but it offers good working material and a clear perspective.

Let us define curriculum as an outline of what will be taught. A math curriculum specifies the mathematical subjects, topics, skills, and concepts that students will learn in a given year. A literature curriculum specifies literary works, periods, genres, themes, ideas, and more. A history curriculum specifies the general area of history, time range, significant events and deeds, people, conflicts, questions, and ideas, as well as certain primary and secondary sources. In addition, the curriculum specifies some of the work that students will complete, from proofs to research papers. It is up to the teacher to decide how to present the material and how to structure the class time. The curriculum may come with sample lessons and various levels of support, but it is not a script.

The Finnish national core curriculum illustrates this definition well.[2] The high school mathematics core curriculum consists of an advanced sequence and a basic sequence. Here is the complete core curriculum for an advanced course called "Trigonometric functions and number sequences":[3]

OBJECTIVES

The objectives of the course are for students to

- learn to examine trigonometric functions by means of the symmetries of the unit circle;
- learn to solve trigonometric equations of the form $\sin f(x) = a$ or $\sin f(x) = \sin g(x)$.

MATHEMATICS

- command the trigonometric relationships $\sin^2 x + \cos^2 x = 1$ and $\tan x = \sin x / \cos x$;
- examine trigonometric functions by means of the derivative;
- understand the concept of the number sequence;
- learn to define number sequences by means of recursion formulae;
- know how to solve practical problems by means of arithmetic and geometric progressions and their sums.

CORE CONTENTS

- directed angles and radians;
- trigonometric functions, including their symmetric and periodic properties;
- solving trigonometric equations;
- derivatives of trigonometric functions;
- number sequences;
- recursive number sequences;
- arithmetic progressions and sums;
- geometric progressions and sums.

These descriptions are concise and focused on the content. Because of the coherence and careful coordination of the Finnish educational system—from teacher training to student exams—it is assumed that teachers will understand these descriptions and know how to translate them into lessons. Teachers in Finland have considerable preparation and autonomy; they may select the textbooks and determine how to teach the topics.[4] We need not replicate the Finnish curriculum exactly, but we can derive inspiration from it. We can develop a curriculum that is much more specific than our current standards but still leaves the methods of instruction to the teachers.

Standards as we know them are not the same as curriculum. For example, most states' English language arts standards avoid mentioning any specific works of literature or even areas of literature; they tend to emphasize reading strategies over literary content.[5] The recently developed Common Core State Standards improve on this by specifying certain categories of literature and including an appendix with high-quality text exemplars. (Full disclosure: I contributed to the text exemplars as a member of the English Language Arts Work Team.) Yet even with these details, the Common Core State Standards make clear that they are not a curriculum: "while the Standards make references to some particular forms of content, including mythology, foundational U.S. documents, and Shakespeare, they do not—indeed, cannot—enumerate all or even most of the content that students should learn. The Standards must therefore be complemented by a well-developed, content-rich curriculum consistent with the expectations laid out in this document."[6]

A strong curriculum brings clarity to a school's endeavor; it has practical, intellectual, and philosophical benefits—and leaves teachers room for professional judgment and creativity.

A good curriculum requires both vision and practicality. The curriculum writers must know and care about the subject; they must envision the teaching of the topics and works. They must be willing to make and defend choices—to say "this is essential," "this is beautiful," or "this goes well with that." At the same time, a curriculum cannot be the work of one person alone. Teachers and principals should be invited to contribute to it, the public should have a chance to discuss it, and it should be refined over time. Yet the multitude of contributions must not result in long, dizzying lists of topics and goals. Educator William C. Bagley wrote in 1934 that "American education has long been befuddled by the multiplication of 'aims' and 'objectives'";[7] the problem persists today, and we should not make it worse. No matter how many people contribute to a curriculum, it should not lose its coherence and

meaning; it should not try to be everything at once, or it may turn into nothing.

Why is a curriculum essential?

Let us start with the practical reasons. First of all, when teachers know what they are supposed to teach, they can put their energy into planning and conducting lessons and correcting student work. If teachers have to figure out what to teach, then there are many moving pieces at once and too much planning on the fly. Also, there is too much temptation to adjust the actual subject matter to the students—if they don't take to the lesson immediately, the teacher may get in the habit of scrambling for something they do like, instead of showing them how to persevere. With a common curriculum, the teacher has the authority to expect students to learn the material.

For me, a great benefit of teaching in a school with a strong, coherent curriculum was that I could draw extensively on students' background knowledge. I could ask fourth-graders what they knew about the Middle Ages, and hands would fly up. It was exciting to direct the students in *A Midsummer Night's Dream* and find that they understood some of the references to classical mythology. When my fifth-grade students were reading *Adventures of Huckleberry Finn*, a passage reminded a student of a Robert Frost poem. She ran to the bookshelf, found the poem, and read it aloud. Again and again, students drew on what they had learned in their classes. The principle is obvious: it is impossible and undesirable to control everything that students bring to a class, but certain planned sequences can deepen and intensify the instruction.

A curriculum helps ensure continuity not only from grade to grade but from town to town. If a family moves from one town or state to another, a curriculum helps prevent needless repetition. I attended many schools when I was a child; it seemed that almost every year, until high school, we began by making a family tree for social studies and learning about sets and subsets in math. Many children endure units on "me and my community" year after year. (Sadly, this also happens to some students who do not change schools, but who attend schools where there is no curriculum and little or no coordination among teachers.) A curriculum would protect students against this kind of redundancy.

The list of practical benefits continues. Schools are in a position to seek out the best books possible when they know what will be taught. Teachers, working together and individually, may refine their teaching of certain topics over the years, since the topics will not be taken away. Materials that accompany the curriculum—such as tests and textbooks—can be strengthened if the curriculum is not constantly changing. Parents can tell whether or not their children are learning, since they know what their children are supposed to learn. Summer school, for students who need it, can ensure that students master the previous year's specific content and skills, and can also preview the coming year's challenges. Cities and towns may hold special events related to the curriculum—for instance, there might be a lecture on space exploration, a discussion of Martin Luther King, Jr.'s "Letter from Birmingham City Jail," or a performance of Sergei Prokofiev's *Peter and the Wolf*. Students might take field trips to attend a play or view works of art that they have studied.

What about the intellectual benefits of curriculum? I have hinted at them above. A curriculum allows a school or community to come together over a topic or work; it allows students, teachers, and parents to probe the topic more deeply. Teachers' professional development sessions may be devoted to topics in philosophy, literature, science, and other subjects, not just to the latest mandates and pedagogical techniques. Imagine a teacher seminar on Plato's *Republic*, Rabindranath Tagore's *The Post Office*, or Eugene Ionesco's *Rhinoceros*—how interesting that would be! When teachers have the opportunity to probe the very topics that they are teaching, to challenge each other, and to build on existing resources, they have that much more to bring to their students. The students, being immersed in meaningful subjects, will bring their learning to their families and friends.

A curriculum allows schools to uphold things of importance and beauty. Even if we disagree over what is good, we must dare to select the best.

I had the honor of visiting the Dallas Institute of Humanities and Culture in July 2010. The institute holds year-round events devoted to literature and humanities. At its Summer Institute for Teachers, school teachers immerse themselves in classic literature. This year, the Summer Institute focused on the epic tradition; teachers read and discussed the *Iliad*, the *Odyssey*, the *Aeneid*, the *Divine Comedy*, *Moby-Dick*, the *Epic of Gilgamesh*, and the *Theogony*; excerpts from the *Ramayana*, *Popol Vuh*, and *Paradise Lost*; and various short pieces. I was there for the first three days, which were devoted to the *Iliad*. It was a stirring experience to be among teachers and scholars who were reading and pondering this work. I had read parts of it in Greek in high school and reread it in English over the years, but I had not read it in full in a long time. Here I read it morning and night; read it urgently, dreamily, sleepily; read it with others, alone, aloud, and in quiet. When we reached the end, it was as though my mind had swept itself of litter. If we had more institutes like this, and if teacher training included courses of this kind, we could possibly see a slow transformation of the teaching profession. A teacher's daily work is typically filled with minutiae: he or she must decorate the classroom according to mandates, complete vague student goal sheets and in-class conference notes, and attend meeting after meeting where jargon reigns. A strong curriculum, supported by institutes of this kind, can help schools stay grounded in things that matter.

Just as a curriculum brings people together, it makes room for

solitary thought. Teachers need time to plan and think alone as well as with others. They need intellectual stimulation and challenge, quiet hours with the books and problems. A curriculum allows teachers to pursue topics in depth. If it is known that students will be reading Robert Louis Stevenson, then the teacher may delve into *A Child's Garden of Verses*—both for pleasure and for preparation. There is room to focus on something worthy. When there is no curriculum, teachers are kept busy but not necessarily in the best ways. After selecting what to teach, chasing after the materials, and putting together lessons, teachers have little time to think about the chosen topic, to consider different ways of teaching it, or to respond to students' insights and difficulties. A curricular plan, by establishing certain things, leaves more room for thinking, especially if administrators are careful to keep the peripheral duties to a minimum.

This leads into some philosophical reasons for a curriculum. A curriculum allows schools to uphold things of importance and beauty. We do children no favor by pretending all texts are equal, all opinions are equal, all writing is wonderful, and everyone is a poet; it is simply not so. There is poetry that makes the jaw drop and "poetry" that has not earned the name. Even if we disagree over what is good, we must dare to select the best. At my school with a common curriculum, when I directed my elementary school students in *A Midsummer Night's Dream*, I saw how they took to the language. One boy had wanted with all his heart to play the role of Nick Bottom, and his zesty rendition made the audience roar: "The raging rocks / And shivering shocks / Shall break the locks / Of prison gates…." Once, when I was bringing the second-graders up to the fourth floor to rehearse, I reminded them, "Walk quietly, like fairies." A girl chimed in, quoting from the play: "And hang a pearl in every cowslip's ear!"[8] It was clear that their imaginations had been fired up by Shakespeare's language. *A Midsummer Night's Dream* was part of the fifth-grade curriculum; having students perform it was an extension and enhancement of this. Had the play not been in the curriculum at all, the production might have seemed an extravagance or impossibility. But because it was part of the curriculum, it was also part of the school culture. Even the younger students, who had never read any Shakespeare before, had heard of Shakespeare from the older students. Some students read the play at home with their parents, siblings, and relatives. Teachers talked about Shakespeare in their classes and gave students opportunities to perform their scenes and monologues for their fellow students. Long after the final performance, Shakespeare was in the air.

As it makes room for things of importance and beauty, an excellent curriculum keeps fads at bay. If a school understands what it is teaching and why, if it is willing to defend its choices, then no random consultant or salesperson will be able to convince the school to buy the latest program, package, or gadget. When considering something new, teachers and administrators will ask themselves and each other, "Does this contribute to our curriculum, to what we are doing and what we value?" If it does, they might consider it further. If it doesn't, they will turn it down. There will still be distractions, fads, and jargon, but their clout will be greatly diminished.

Of course, conflicts do arise over curriculum. If we create a core curriculum for many schools and even many states, how can we ensure that it represents what schools and teachers deem important? What if a school doesn't like it but has to use it anyway? Doesn't that breed hypocrisy? What if a teacher has a radically different vision of a particular course? Must this teacher submit to the curriculum? What if the parents object to something in it? What if it conflicts with the religious views of some part of the community?

These are serious problems. Yet there must be a better solution than avoiding curriculum altogether or leaving it to individual schools and teachers. Today, in districts where each school devises its own curriculum, we have severe discrepancies and inconsistencies. One school teaches grammar, while another does not. One teaches the history of the Middle Ages, while another does not. Pseudo-curricula—pedagogical models without content—find their way into many schools, and state and national tests focus largely on skills.

The first school where I taught, a middle school in Brooklyn, followed the Teachers College "workshop model," which specifies how to teach but not what to teach. In my subject, English as a second language (ESL), teachers were expected to adapt instruction to the students' varying levels and needs; there was no common body of literature or vocabulary that all students were supposed to learn. Soon I found that the same was true for English language arts (ELA); the primary emphasis was on reading strategies and writing processes. Teachers were supposed to bring "content" into their lessons, but all sorts of things qualified as content, and teachers could not rely on students' background knowledge from previous years. My school was by no means unique in this regard. New York City did not have a middle school literature curriculum for ESL or ELA; the curriculum consisted mainly of a pedagogical model and a set of strategies and skills. To have a literature curriculum, a school would have to go beyond what the city offered.

To some degree, I enjoyed the freedom to choose what to teach. I started a musical drama club for English language learners; in the first year, they put on a full production of *The Wizard of Oz*,[9] and in the following years they performed *Oliver!* and *Into the Woods*. I introduced my intermediate and advanced students to classic literature: *Antigone*, *Romeo and Juliet*, *The Glass Menagerie*,

Animal Farm, and *The Old Man and the Sea*; some excerpts from Plato and Augustine; poems by Shakespeare, Blake, Poe, and Yeats; Sherlock Holmes mysteries; and various other works. These were challenging selections, especially for an ESL class, but students took to them, some passionately. My students read and discussed the Constitution and memorized the Preamble; they wrote bills and debated them in mock sessions of Congress. I gave them daily practice in conversation and writing; I gave grammar lessons and held spelling bees. I was proud and excited to see my students' enthusiasm for the literature; some of them wrote additional essays voluntarily, just because they found a work interesting. Like most new teachers, I struggled with classroom management, paperwork demands, and general exhaustion—but loved teaching and was proud of my students. I had kind and helpful colleagues and supportive administrators. Yet I began to long for a curriculum. I wanted to do the literature greater justice; I wanted to teach real courses, with a coherent combination of literary works. I wanted to teach grammar explicitly and systematically. It is not that everything must be fixed and regular—but when the topics are established, there is room to teach them in interesting ways and to learn from other teachers.

Wondering how New York City schools had come to emphasize strategies and group work over curriculum, I started to read avidly about education. I found much wisdom and inspiration in the works of education historian Diane Ravitch, Core Knowledge founder E. D. Hirsch, Jr., cognitive scientist Daniel Willingham, and writers of the past, including William Torrey Harris, William C. Bagley, Michael John Demiashkevich, Isaac Leon Kandel, and Boyd H. Bode. I learned that many "new" approaches to teaching were not new at all; some fads had come back again and again under different guises. Reading Diane Ravitch's *Left Back*, I became fascinated with Demiashkevich (1891–1938), who put the education trends of his time in philosophical perspective. His writing sparkled with references to literature, history, philosophy, and mythology; one book led me to another. I traveled to Nashville to peruse the Demiashkevich Papers in Vanderbilt University's Special Collections and later wrote an article about his work.[10] It was exciting to find kindred thinkers from whom I could learn so much. Upon reading Hirsch's *The Schools We Need and Why We Don't Have Them*, I became interested in the Core Knowledge curriculum for grades K through 8. I found the sequence and topics tantalizing: for example, seventh-graders read poetry by Poe, Dickinson, Tennyson, Blake, Service, Owen, Frost, Cullen, Eliot, Hughes, and Williams; study the Pythagorean Theorem; learn the geography of Western and Central Europe; learn about World War I and the Russian Revolution; and much more. At the end of my third year of teaching, I interviewed at a Core Knowledge elementary school and was offered a position that turned out to be rewarding, in large part because of the curriculum. Both schools had strengths and weaknesses, but the curriculum at the second school was both solid and inspiring.

How can one curriculum serve many schools?

One essential feature of a common core curriculum is that it should not take up all of the school day. It could constitute about 50 to 75 percent of instructional time, and the rest could be left to the discretion of the states, districts, schools, and teachers. The common curriculum should be a beginning, not an end. Teachers should have the freedom to put their best thought into it and to show others what they have done in the classroom. There should be no shame over taking a moment to contemplate a topic during a lesson or go into its fine points. A sense of beauty and concrete learning are not at odds with each other, when both are given their place.

A good curriculum allows the mind to play. Just as a hundred musical variations can come from a single theme, so a rich variety of lessons can spring from a single topic.

At the Core Knowledge school, I worked with one of my second-grade classes on enactments of Christina Rossetti's poem "Who has seen the wind?" (included in the Core Knowledge curriculum).[11] The poem brilliantly blends the visible and invisible: "Who has seen the wind? / Neither I nor you: / But when the leaves hang trembling / The wind is passing thro'. // Who has seen the wind? / Neither you nor I: / But when the trees bow down their heads / The wind is passing by." One or two students would recite it while four others acted as the trees. By the end of the first lesson, most of the class knew it by heart. Drill and kill? Rote memorization? Not quite. There were so many children volunteering to recite it, I couldn't get to them all. During the second lesson, a girl started bouncing up and down in her seat and pointing at the window. "They're doing it!" she cried. "The leaves are trembling!" The others chimed in: "The wind is passing through!"

Another key to adopting a shared curriculum is a willingness to treat it as a living document. Any curriculum, no matter how well considered, should be reviewed and refined over time. Teachers and principals should participate in this process. This will inspire teachers, once again, to articulate and defend what they deem important, and it will lead to interesting discussions. In his forthcoming book, education professor Wesley Null describes the deliberative tradition of curriculum making. He defines deliberation as "the practice of using our reason, language, and emotions to appreciate one another's views while at the same time persuading others to follow what we believe is right." It is not easy by any

means, nor is it coercive; it is "the opposite of screaming matches in which one side seeks to control the other."[12] The more willingly we engage in deliberation, the likelier we are to arrive at a curriculum that all parties can appreciate. Disagreements will not disappear, but we will gain more insight into them, and the common ground we find will be sturdier.

As mentioned before, the teacher has great freedom with the kind of curriculum described here. The curriculum outlines the topics (and, for some subjects, the works) that will be taught, but the teacher may decide how to teach them. Those who need extra support may use existing unit and lesson plans. Also, since other teachers in the school and district will be using the same curriculum, any teacher needing such support will have many colleagues to turn to. The Core Knowledge curriculum, used by my second school, includes several levels of support. First, there is the Core Knowledge Sequence, which outlines what students need to learn in each grade and subject. Next, there is a parent and teacher guide for each grade (through grade 6) that describes the topics in more detail. Beyond that, there are numerous teacher and classroom resources, including guides, handbooks, planners, books, and videos.

A curriculum can offer both structure and flexibility. In *Cultural Literacy*, Hirsch describes a curriculum that consists of two parts or aspects: an extensive curriculum, in which students acquire the broad knowledge necessary for cultural literacy (e.g., the ability to participate in our democratic society), and an intensive curriculum, which provides for deep study of a subject. A dual curriculum of this kind allows for variation from school to school while specifying a body of common knowledge. For instance, all schools may teach Shakespeare, and all students may learn something about the best-known Shakespeare plays. Yet schools may choose different Shakespeare plays for close study.[13] The specific selections allow schools to make interesting combinations. For example, if the curriculum included *King Lear* and Erasmus's *Praise of Folly*, students might compare the treatment of folly in the two works after reading each work closely.[14]

Some may object that a curriculum should be spontaneous, not fixed, that the teacher and students should have room to delve into a topic that comes up unexpectedly. Educator and reformer Deborah Meier describes a time when the schoolyard at the Mission Hill School in Boston was full of snails, and the school embarked on a three-month study of snails.[15] This kind of spontaneous investigation can delight the mind and inspire future study. It also takes tremendous teacher expertise and can easily go awry. A school should have the flexibility to devote extra time to certain topics, or to pursue a topic spontaneously here and there (which would be possible with a common core curriculum that took just 50 to 75 percent of instructional time), but it should do so judiciously and sparingly. An established curriculum has great advantages: teachers can think about it long in advance and schools can build their resources over time. Also, as interesting as "real-world" education can be, it needs a counterbalance; it is vital for students to learn about other places and times, and to work with abstract ideas.

Very well, then. Suppose we do have a curriculum.

What do schools need to implement a curriculum well?

Improved teacher preparation, textbooks, and assessments are all crucial. Teacher preparation programs should include courses on the curriculum itself. Prospective teachers should study the topics at advanced levels and consider how to present them to students. Education schools must honor subject matter as well as pedagogy. Teachers entering the classroom should have thought deeply about the subject they are to teach and should be well equipped with resources.

Textbooks should be of the highest caliber—free of clutter and full of clear, interesting, challenging material. As Diane Ravitch has pointed out, literature and history textbooks are too often crammed with pictures, graphs, charts, and pedagogical strategies, with little room for the text itself.[16] The best textbooks, by contrast, are simple and elegant, with a great deal of knowledge conveyed in few pages. One of my favorites from high school is *A New Introduction to Greek* by Alston Hurd Chase and Henry Phillips, Jr. Each chapter begins with an explanation of the new grammatical material. This is followed by reading (including excerpts of Greek literature), vocabulary, translation exercises, review exercises, and sometimes an illustration at the end. I remember the excitement of reading one of Euclid's theorems in Greek early on in the course. The theorem was unadorned, and this brought out its beauty; there was no condescension or distraction in the presentation. At the middle school level, Joy Hakim's 10-volume series *A History of US* sets a fine example with its clear, elegant presentation and absorbing narrative.

Assessments must be based on the curriculum—not on standards. Otherwise, the tests will end up defining or constraining the curriculum (as they too often do now) in ways that the schools and public did not antici-

(Continued on page 54)

Beyond Comprehension

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

ILLUSTRATIONS BY JAMES YANG

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 3.) 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

E. D. Hirsch, Jr., is a professor emeritus at the University of Virginia and the author of many articles and books, including the bestsellers Cultural Literacy *and* The Schools We Need. *He is a fellow of the American Academy of Arts and Sciences and the founder of the Core Knowledge Foundation.* *This article is adapted from* The Knowledge Deficit: Closing the Shocking Education Gap for American Children *by E. D. Hirsch, Jr.*

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]

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.)

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.

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

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.

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, as shown over pages 37 to 43, we are now offering a complete language arts program for kindergarten through second grade. 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.

Because of student mobility, nothing short of a common curriculum—one shared by all schools—will do.

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.

Mathematical Ability Relies on Knowledge, Too

BY JOHN SWELLER, RICHARD E. CLARK, AND PAUL A. KIRSCHNER

Problem solving is central to mathematics. Yet problem-solving skill is not what it seems. Indeed, the field of problem solving has recently undergone a surge in research interest and insight, but many of the results of this research are both counterintuitive and contrary to many widely held views. For example, many educators assume that general problem-solving strategies are not only learnable and teachable but are a critical adjunct to mathematical knowledge. The best-known exposition of this view was provided by the mathematician George Pólya.[1] He discussed a range of general problem-solving strategies, such as encouraging mathematics students to think of a related problem and then solve the current problem by analogy, or to think of a simpler problem and then extrapolate to the current problem. The examples Pólya used to demonstrate his problem-solving strategies are fascinating, and his influence probably can be sourced, at least in part, to those examples. Nevertheless, in over a half century, no systematic body of evidence demonstrating the effectiveness of any general problem-solving strategies has emerged. It is possible to teach learners to use general strategies such as those suggested by Pólya,[2] but that is insufficient. There is no body of research based on randomized, controlled experiments indicating that such teaching leads to better problem solving.

Recent "reform" curricula both ignore the absence of supporting data and completely misunderstand the role of problem solving in cognition. If, the argument goes, we are not really teaching people mathematics but rather are teaching them some form of general problem solving, then mathematical content can be reduced in importance. According to this argument, we can teach students how to solve problems in general, and that will make them good mathematicians able to discover novel solutions irrespective of the content.

We believe this argument ignores all the empirical evidence about mathematics learning. Although some mathematicians, in the absence of adequate instruction, may have learned to solve mathematics problems by discovering solutions without explicit guidance, this approach has never been the most effective or efficient way to learn mathematics.

The alternative route to acquiring problem-solving skill in mathematics derives from the work of a Dutch psychologist, Adriaan de Groot,[3] investigating the source of skill in chess. Researching why chess masters always defeated weekend players, de Groot managed to find only one difference. He showed masters and weekend players a board configuration from a real game, removed it after five seconds, and asked them to reproduce the board. Masters could do so with an accuracy rate of about 70 percent compared with 30 percent for weekend players. Other researchers replicated these results and additionally demonstrated that when the experiment was repeated with random configurations, rather than real-game configurations, masters and weekend players had equal accuracy (roughly 30 percent).[4] Masters were superior only for configurations taken from real games.

Chess is a problem-solving game whose rules can be learned in about 30 minutes. Yet it takes at least 10 years to become a chess master. What occurs during this period? When studying previous games, chess masters learn to recognize tens of thousands of board configurations and the best moves associated with each configuration.[5] The superiority of chess masters comes not from having acquired clever, sophisticated, general problem-solving strategies, but rather from having

John Sweller is an emeritus professor of education at the School of Education at the University of New South Wales. Richard E. Clark is a professor of educational psychology, clinical research professor of surgery, and director of the Center for Cognitive Technology at the University of Southern California. Paul A. Kirschner is a professor of educational psychology at the Centre for Learning Sciences and Technologies at the Open University of the Netherlands. *This article is adapted, with permission from the American Mathematical Society, from John Sweller, Richard Clark, and Paul Kirschner, "Teaching General Problem-Solving Skills Is Not a Substitute for, or a Viable Addition to, Teaching Mathematics," which appeared in the* Notices of the American Mathematical Society *57, no. 10 (November 2010), 1303–1304,*

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.

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

stored innumerable configurations and the best moves associated with each in long-term memory.

De Groot's results have been replicated in a variety of educationally relevant fields, including mathematics.[6] They tell us that long-term memory, a critical component of human cognitive architecture, is not used to store random, isolated facts, but rather to store huge complexes of closely integrated information that results in problem-solving skill. That skill is knowledge domain-specific, not domain-general. An experienced problem solver in any domain has constructed and stored huge numbers of schemas in long-term memory that allow problems in that domain to be categorized according to their solution moves. In short, the research suggests that we can teach aspiring mathematicians to be effective problem solvers only by helping them memorize a large store of domain-specific schemas. Mathematical problem-solving skill is acquired through a large number of specific mathematical problem-solving strategies relevant to particular problems. There are no separate, general problem-solving strategies that can be learned.

How do people solve problems that they have not previously encountered? Most employ a version of means-ends analysis in which differences between a current problem-state and goal-state are identified and problem-solving operators are found to reduce those differences. There is no evidence that this strategy is teachable or learnable because we use it automatically.

But domain-specific mathematical problem-solving skills *can* be taught. How? One simple answer is by emphasizing worked examples of problem-solution strategies. A worked example provides problem-solving steps and a solution for students.[7] There is now a large body of evidence showing that studying worked examples is a more effective and efficient way of learning to solve problems than simply practicing problem solving without reference to worked examples.[8] Studying worked examples interleaved with practice solving the type of problem described in the example reduces unnecessary working-memory load that prevents the transfer of knowledge to long-term memory. The improvement in subsequent problem-solving performance after studying worked examples rather than solving problems is known as the worked-example effect.[9]

Whereas a lack of empirical evidence supporting the teaching of general problem-solving strategies in mathematics is telling, there is ample empirical evidence of the validity of the worked-example effect. A large number of randomized controlled experiments demonstrate this effect.[10] For novice mathematics learners, the evidence is overwhelming that studying worked examples rather than solving the equivalent problems facilitates learning. Studying worked examples is a form of direct, explicit instruction that is vital in all curriculum areas, especially areas that many students find difficult and that are critical to modern societies. Mathematics is such a discipline. Minimal instructional guidance in mathematics leads to minimal learning.[11]

Reformers' zeal to improve mathematics teaching and increase students' mathematical problem solving is laudatory. But instead of continuing to waste time devising "reform" curricula based on faulty ideas, mathematicians and math educators should work together to develop a sound K–12 curriculum that builds students' mathematical knowledge through carefully selected and sequenced worked examples. ❑

Long-term memory is not used to store isolated facts, but to store huge complexes of integrated information that results in problem-solving skill. That skill is knowledge domain-specific, not domain-general.

Endnotes

1. George Pólya, *How to Solve It: A New Aspect of Mathematical Method*, 2nd ed. (Garden City, NY: Doubleday, 1957).
2. Alan H. Schoenfeld, *Mathematical Problem Solving* (Orlando: Academic Press, 1985).
3. Adriaan D. de Groot, *Thought and Choice in Chess* (The Hague, Netherlands: Mouton Publishers, 1965).
4. William G. Chase and Herbert A. Simon, "Perception in Chess," *Cognitive Psychology* 4, no. 1 (January 1973): 55–81.
5. Herbert A. Simon and Kevin Gilmartin, "A Simulation of Memory for Chess Positions," *Cognitive Psychology* 5, no. 1 (July 1973): 29–46.
6. John Sweller and Graham A. Cooper, "The Use of Worked Examples as a Substitute for Problem Solving in Learning Algebra," *Cognition and Instruction* 2, no. 1 (1985), 59–89.
7. Jeroen J. G. van Merriënboer and Paul A. Kirschner, *Ten Steps to Complex Learning: A Systematic Approach to Four-Component Instructional Design* (Mahwah, NJ: Lawrence Erlbaum, 2007).
8. Fred Paas and Tamara van Gog, "Optimising Worked Example Instruction: Different Ways to Increase Germane Cognitive Load," *Learning and Instruction* 16, no. 2 (2006): 87–91.
9. Paas and van Gog, "Optimising Worked Example Instruction."
10. Rolf Schwonke, Alexander Renkl, Carmen Krieg, Jorg Wittwer, Vincent Aleven, and Ron Salden, "The Worked-Example Effect: Not an Artefact of Lousy Control Conditions," *Computers in Human Behavior* 25, no. 2 (2009): 258–266; and Sweller and Cooper, "The Use of Worked Examples."
11. Paul A. Kirschner, John Sweller, and Richard E. Clark, "Why Minimal Guidance during Instruction Does Not Work: An Analysis of the Failure of Constructivist, Discovery, Problem-Based, Experiential, and Inquiry-Based Teaching," *Educational Psychologist* 41, no. 2 (2006), 75–86.

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' deemphasis 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. ❐

The chief cause of our schools' inefficiency is curricular incoherence. At the beginning of the year, the teacher cannot be sure what the entering students know.

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, 176–179.

2. See Christopher Jencks, "What's Behind the Drop in Test Scores?" (working paper, Department of Sociology, Harvard University, Cambridge, MA, July–August 1978).

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

4. Wolfgang Schneider and Joachim Korkel, "The Knowledge Base and Text Recall: Evidence from a Short-Term Longitudinal Study," *Contemporary Educational Psychology* 14, no. 4 (1989): 382–393, "Performance was more a function of soccer knowledge than of aptitude level."

5. For reviews of the scientific literature on these subjects, see Hirsch, *Cultural Literacy*; Hirsch, *The Schools We Need*; Wolfgang Schneider, Joachim Korkel, and Franz Emanuel Weinert, "Expert Knowledge, General Abilities, and Text Processing," in *Interactions among Aptitudes, Strategies, and Knowledge in Cognitive Performance*, ed. Wolfgang Schneider and Franz Emanuel Weinert (New York: Springer-Verlag, 1990).

6. Letter to Colonel Edward Carrington, January 16, 1787, taken from *The Life and Selected Writings of Thomas Jefferson*, ed. Adrienne Koch and William Peden (New York: Random House, 1944), 411–412.

7. Nelson W. Francis and Henry Kucera, *Frequency Analysis of English Usage: Lexicon and Grammar* (Boston: Houghton Mifflin, 1982).

8. John Willinsky, "The Vocabulary of Cultural Literacy in a Newspaper of Substance" (paper presented at the annual meeting of the National Reading Conference, Tucson, AZ, November 29–December 3, 1988).

9. Hirsch, *Cultural Literacy*.

10. Deborah L. Cohen, "Frequent Moves Said to Boost Risk of School Problems," *Education Week*, September 22, 1993, 15. See also David Wood, Neal Halfon, Debra Scarlata, Paul Newacheck, and Sharon Nessim, "Impact of Family Relocation on Children's Growth, Development, School Function, and Behavior," *Journal of the American Medical Association* 270, no. 11 (September 15, 1993): 1334–1338.

11. Deborah Cohen, "Moving Images," *Education Week*, August 3, 1994, 32–39; David Kerbow, "Patterns of Urban Student Mobility and Local School Reform," *Journal of Education for Students Placed at Risk* 1, no. 2 (1996); Shana Pribesh and Douglas B. Downey, "Why Are Residential and School Moves Associated with Poor School Performance?" *Demography* 36, no. 4 (1999): 521–534; Thomas Fowler-Finn, "Student Stability vs. Mobility," *School Administrator* 58, no. 7 (August 2001): 36–40; Russell W. Rumberger, Katherine A. Larson, Robert K. Ream, and Gregory J. Palardy, *The Educational Consequences of Mobility for California Students and Schools*, PACE Policy Brief (Berkeley, CA: Policy Analysis for California Education, 1999); and Del Stover, "The Mobility Mess of Students Who Move," *Education Digest* 66, no. 3 (2000): 61–64.

12. U.S. General Accounting Office, *Elementary School Children: Many Change Schools Frequently, Harming Their Education* (Washington, DC: GAO, 1994).

13. Bruce C. Straits, "Residence, Migration, and School Progress," *Sociology of Education* 60 (1987): 34–43, cited in H. J. Walberg, "Improving Local Control and Learning," preprint 1994.

14. Harold W. Stevenson and James W. Stigler, *The Learning Gap: Why Our Schools Are Failing and What We Can Learn from Japanese and Chinese Education* (New York: Summit, 1992).

15. Hirsch, *The Schools We Need*, 38–41; Centre for Educational Research and Innovation, *Immigrants' Children at School* (Paris: Organisation for Economic Co-operation and Development, 1987).

16. Hirsch, *The Schools We Need*, 22–26.

Envisioning a Common Core Curriculum

Authors throughout this special issue of American Educator *advocate for a common core curriculum. But what should such a curriculum look like? How specific should it be, and in what ways should it support teaching? As long as it is truly a core curriculum—leaving about one-third of instructional time free for districts, schools, and teachers to add their own materials and projects—we'll venture to say that it should be detailed and specific, but not scripted. It should offer extensive support for teaching, such as lesson plans and classroom assessments, but using those supports should not be mandatory. The new Core Knowledge Language Arts Program for kindergarten through second grade seems to fit that description. While the program is new, pilot testing has demonstrated its effectiveness, and refinements based on teacher and researcher feedback are ongoing. In addition, the* Core Knowledge Sequence*, from which it is derived, has been used in schools across the country for 20 years. We hope this high-quality example will generate discussions throughout schools and statehouses about how detailed and supportive a common core curriculum for our nation ought to be.*

–EDITORS

Listening and Learning

How a Carefully Crafted Language Arts Program Builds Knowledge and Strong Readers

The Core Knowledge Language Arts Program for kindergarten through second grade consists of two separate strands: (1) Skills and (2) Listening and Learning. The Skills Strand teaches sounds and the letters that represent them, beginning with the simplest sound-letter correspondences, and presenting reading and writing in tandem as inverse (decoding/encoding) procedures. Automaticity and fluency also are emphasized as students are given fully decodable texts to practice reading aloud independently. The Listening and Learning Strand builds students' listening comprehension—a prerequisite to reading comprehension—by exposing students to complex texts that are read aloud daily, systematically increasing their vocabulary and knowledge. In each grade, 12 subject-matter domains—shown on the next page—are explored through fiction and nonfiction texts.

Although most widely used reading programs could improve their approach to reading skills (such as decoding and fluency), their primary weakness is building comprehension. Based on the mistaken belief that reading comprehension relies more on strategies (like finding the main idea) than on knowledge, they only minimally extend children's knowledge, leaving students unprepared for more advanced texts in later grades. Therefore, here and on the following six pages, we have chosen to show excerpts from the Core Knowledge Language Arts Program's Listening and Learning Strand. To download the *Core Knowledge Sequence* and learn more about the new program, see **www.coreknowledge.org**.

Comprehension Relies on Knowledge

Building Broad Knowledge: Key Domains Expand Children's View of the World

Kindergarten:	Grade 1:	Grade 2:*
1 Nursery Rhymes and Fables	1 Fables and Stories	1 Fairy Tales and Tall Tales
2 The Five Senses	2 The Human Body	2 Early Asian Civilizations
3 Stories	3 Different Lands, Similar Stories	3 Cycles in Nature
4 Plants	4 Early World Civilizations	4 The Ancient Greek Civilization
5 Farms	5 Early American Civilizations	5 Greek Myths
6 Native Americans	6 Mozart and Music	6 Insects
7 Kings and Queens	7 Astronomy	7 Westward Expansion
8 Seasons and Weather	8 The History of the Earth	8 The U.S. Civil War
9 Columbus and the Pilgrims	9 Animals and Habitats	9 Charlotte's Web I
10 Colonial Towns and Townspeople	10 Fairy Tales	10 Charlotte's Web II
11 Taking Care of the Earth	11 The Birth of Our Nation	11 Immigration
12 Presidents and American Symbols	12 Frontier Explorers	12 Fighting for a Cause

Building Subject-Matter Knowledge: Solid Preparation for Academic Courses in Later Grades

Literature
Fiction is essential, but all stories are not of equal value. The selected fables, stories, myths, etc., in this program are as much a part of building subject-matter knowledge as the texts about science and social studies. Fictional works appear in each of the domains, with stories like "Bear, Gull, and Crow" in the *Native Americans* domain and "The Grasshopper and the Ants" in the *Seasons and Weather* domain.

Science
From insects to rainbows, children are very curious about the natural world. The science domains are sequenced to build knowledge within grades—as kindergartners progress from *Plants* to *Farms* to *Seasons and Weather* to *Taking Care of the Earth*—and across grades—as children learn about *The Five Senses* in kindergarten and then *The Human Body* in first grade.

Social Studies
Instead of merely "activating" children's existing knowledge of their families and neighborhoods, these domains enlarge children's knowledge. Careful sequencing allows content and ideas to build on each other—such as by moving from *Kings and Queens* to *Columbus and the Pilgrims* to *Presidents and American Symbols* in kindergarten, and on to *The Birth of Our Nation* and *Westward Expansion* in first and second grades.

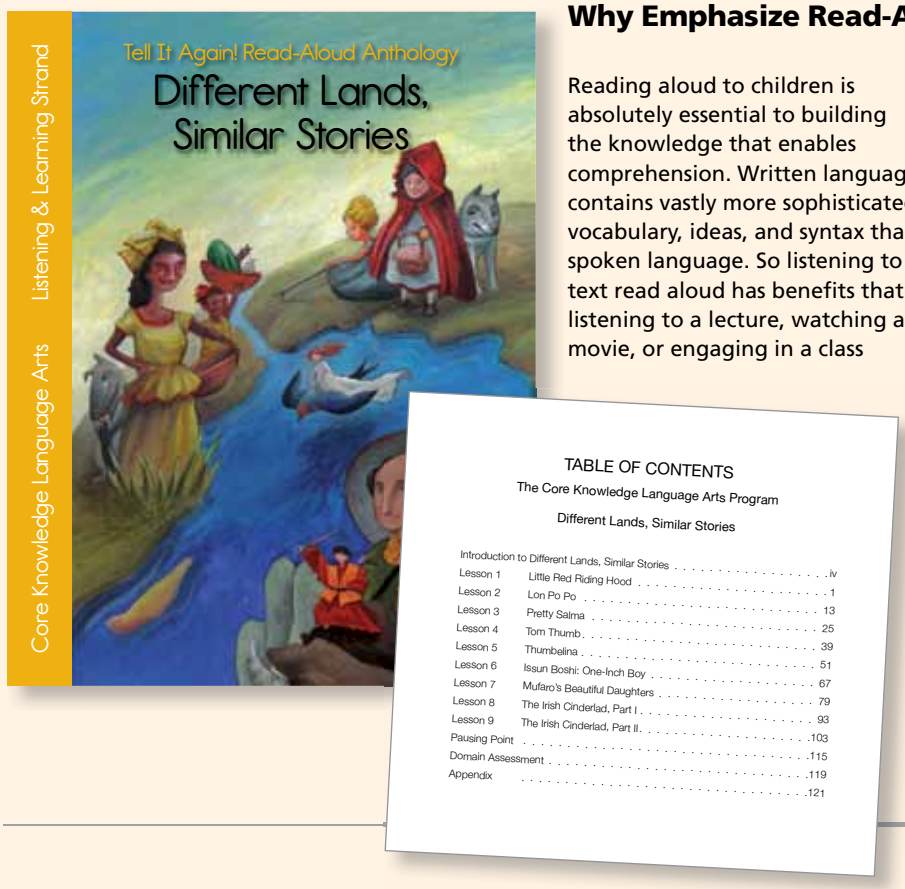
Building Coherent Knowledge: Big Ideas Draw on Multiple Domains and Subjects

In addition to the domains being carefully selected to build essential subject-matter knowledge, they are also purposefully combined within and across grades to develop coherent knowledge. Take a closer look at the kindergarten domains. Several of the science domains help students better understand agriculture, which is essential to the knowledge being built in the social studies domains since early America was largely an agrarian society. An example of carefully constructed coherence across grades is the progression (illustrated above with solid purple arrows) from *Stories* in kindergarten to *Different Lands, Similar Stories*, then *Early World Civilizations* and *Early American Civilizations* in first grade to *Early Asian Civilizations*, *The Ancient Greek Civilization*, and *Greek Myths* in second grade. Looser but still vital connections are also built in, such as the *Plants*, *Farms*, and *Seasons and Weather* domains in kindergarten supporting comprehension of *Animals and Habitats* in first grade and then *Charlotte's Web* in second grade (which is illustrated above with dashed arrows).

*Kindergarten and first-grade materials are currently available. Second-grade materials will be available in the summer of 2011.

Knowledge Takes Time to Build

The Listening and Learning Strand of the Core Knowledge Language Arts Program contains 12 domains per grade, allowing each domain to be studied for at least two weeks using a variety of texts and content-related activities. This focus on one topic at a time is the most efficient way to build students' knowledge and vocabulary. Mastering new topics and new words requires hearing, thinking about, and discussing them repeatedly. Sticking with a topic is also more engaging and enjoyable, since the details (e.g., Mozart was a child prodigy who, at 5 years old, covered himself in ink as he began writing a concerto) are almost always more interesting than the introduction (e.g., Mozart was a composer).



Why Emphasize Read-Alouds?

Reading aloud to children is absolutely essential to building the knowledge that enables comprehension. Written language contains vastly more sophisticated vocabulary, ideas, and syntax than spoken language. So listening to a text read aloud has benefits that listening to a lecture, watching a movie, or engaging in a class discussion cannot provide (although these activities have their own benefits). In addition, students' reading comprehension is not as advanced as their listening comprehension until they are 13 or 14 years old. The need for read-alouds in the early grades is obvious: young children cannot read at all, and children ages 5 to 8 are focused on decoding and gaining fluency. But even after age 9 or so, when most children can read some texts with comprehension, listening comprehension still far surpasses reading comprehension. Eighth-graders, for example, may be able to read their grade-level science textbook, but would still benefit from their teacher reading aloud a more advanced text, such as a popular book for adults by Isaac Asimov. Reading aloud is critical throughout elementary and middle school, even after students become independent readers. The knowledge and vocabulary they gain while listening will support their silent reading and allow them to move more quickly into advanced texts.

Read-Alouds Make for Rich Lessons

To maximize students' learning, each read-aloud comes with a complete lesson, including clear objectives for both the language arts skills and the content knowledge to be mastered, core vocabulary, comprehension questions, and a broad array of extension activities. There are also "Guided Listening Supports" that prompt teachers to explain vocabulary and ask questions to actively engage students in processing and responding while they listen.

The lesson on the following three pages presents the "Teddy Roosevelt's Hero" read-aloud, which is part of the *Presidents and American Symbols* domain in kindergarten.

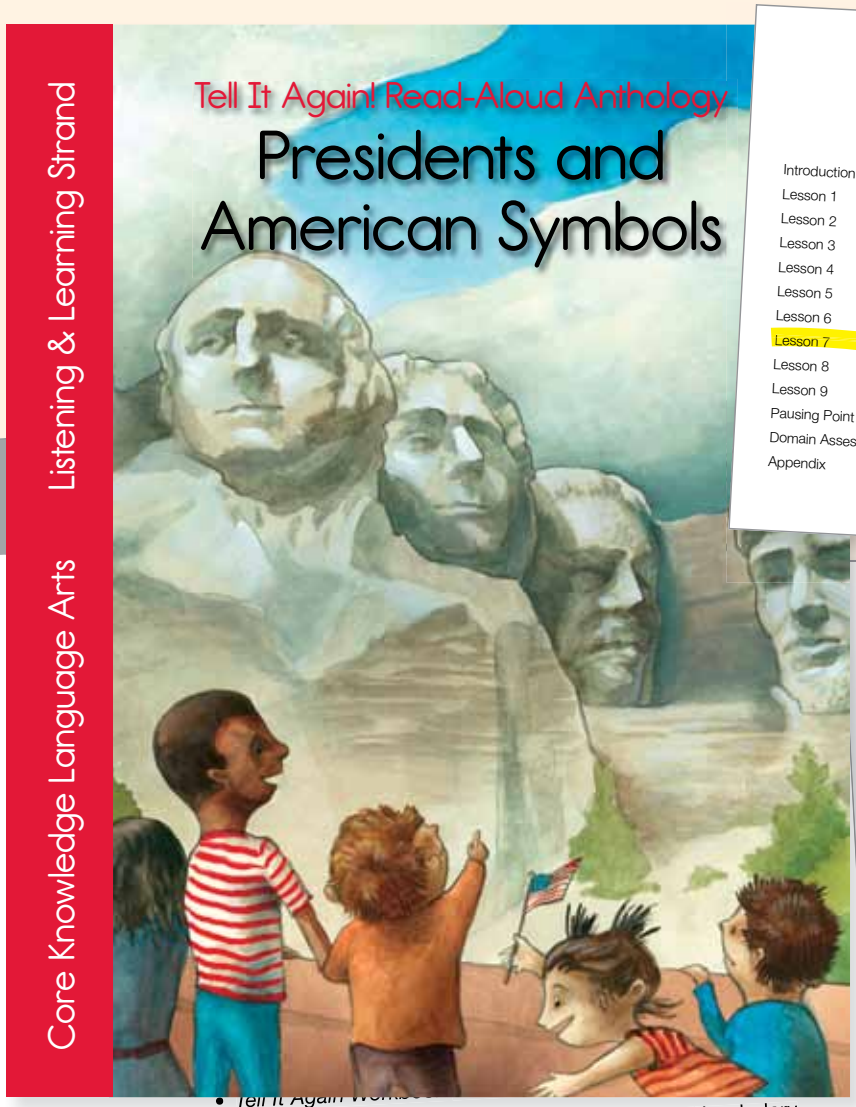


TABLE OF CONTENTS

The Core Knowledge Language Arts Program

Presidents and American Symbols

- *Tell It Again!* Workbook

You will find the Instructional Objectives and Core Vocabulary for this domain below. The lessons that include Student Choice/Domain-Related Trade Book Extensions, Image Cards, Parent Letters, Instructional Masters, and Assessments are also listed in the information below.

Why Presidents and American Symbols Are Important

This domain explores the lives and legacies of four famous presidents and introduces students to several national symbols, including the American flag, the Statue of Liberty, the White House, and Mount Rushmore. Students begin by learning the basics about our government, what a president is, what a president does, and how a person becomes president. It is highly recommended that you cover the *Kings and Queens* domain prior to this domain, because it will be beneficial to draw on students' background knowledge of kingdoms to make a comparison between a king and a president.

If you have already taught the *Columbus and the Pilgrims* domain, you may also draw on what students already learned about the Pilgrims who chose to leave England and later started a colony in America. This connection is important in two ways: Students will realize the Pilgrims wanted the *freedom* to worship as they pleased instead of what the king wanted; students will also understand what the colonies were, and how the Pilgrims were one of many groups of people to set up colonies in North America. It is important to draw on this background knowledge so that students can have a context when they learn about how George Washington fought against England and won freedom for the colonies, which then became the United States of America. Students start out by learning about two of our country's founding fathers, George Washington and Thomas Jefferson. They will hear about the legend of Washington and the cherry tree, and his role as a general in the American Revolution and as the first president. They will then continue on to learn about Jefferson's writing talent and the Declaration of Independence.

Students will also learn that when the colonists decided to fight for their freedom from England, they themselves were keeping freedom from a large number of African-American slaves. The domain then covers Abraham Lincoln, the president of our country during the Civil War, and his role in ending slavery only about two hundred years ago.

Finally, the domain segues to Theodore Roosevelt, who remembers as a child when Abraham Lincoln died, and how this hero made an impact on his growth as an adult and later his presidency. Students will also learn about Roosevelt's love for the outdoors and how he worked for nature conservation.

The domain concludes with a story about the carving of Mount Rushmore, which commemorates the four presidents presented in this domain: George Washington, Thomas Jefferson, Abraham Lincoln, and Theodore Roosevelt.

Teddy Roosevelt's Hero

Lesson Objectives

Core Content Objectives

Students will:

- Recognize Theodore Roosevelt as an important presider United States
- Know that Theodore Roosevelt overcame childhood he problems
- Know that Theodore Roosevelt loved the outdoors

Language Arts Objectives

Students will:

- Use agreed-upon rules for group discussions, i.e., l and listen to the speaker, raise hand to speak, take "excuse me" or "please," etc. (L.K.1)
- Carry on and participate in a conversation over fou turns, staying on topic, initiating comments or res partner's comments, with either an adult or anoth same age (L.K.3)
- Identify and express physical sensations, mental emotions of self and others (L.K.4)
- Listen to and understand a variety of texts, incl stories, fairy tales, fables, historical narratives, text, nursery rhymes, and poems (L.K.11)
- Describe illustrations (L.K.13)
- Answer questions that require making interpretations, judgments, or giving opinions about what is heard in a aloud, including answering "why" questions that requi recognizing cause/effect relationships (L.K.17)
- Make personal connections to events or experiences in aloud and/or make connections among several read-alo (L.K.19)
- Learn new words from read-alouds and discussions (L.K
- Retell important facts and information from a read-aloud

Core Vocabulary

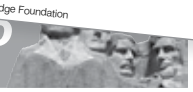
education, *n.* What someone has learned
Example: Because of her good education, Leah knew a lot abou history.
Variation(s): none

expert, *n.* Someone who knows a lot about a subject
Example: The zookeeper is an expert on wild animals and can tell why they behave the way they do.
Variation(s): experts

judge, *v.* To form an opinion about a person or a situation
Example: You should not judge a person by his or her looks; you sh get to know the person.
Variation(s): judges, judged, judging

At a Glance	Exercise	Materials	Minut
Introducing the Read-Aloud	What Have We Already Learned?		10
	Personal Connections		
Presenting the Read-Aloud	Purpose for Listening		
Discussing the Read-Aloud	Teddy Roosevelt's Hero		10
	Comprehension Questions		10
	Word Work: Expert		5
	Complete Remainder of the Lesson Later in the Day		
Extensions	Image Review		
Take-Home Material	Parent Letter	Instructional Master 7B-1	15

7A Teddy Roosevelt's Hero



Introducing the Read-Aloud

10 minutes

What Have We Already Learned?

Remind students that they have heard the stories of three former U.S. presidents so far in this domain. Tell students that you are going to say a statement about one of these great men and they are to name which of the three presidents the statement is about. Tell students their three choices: George Washington, Thomas Jefferson, and Abraham Lincoln.

- This president was admired for his honesty and has a cherry tree legend about him. (George Washington)
- These two presidents were two of the Founding Fathers who helped create the United States of America. (George Washington and Thomas Jefferson)
- This man had a talent for writing, and wrote the Declaration of Independence, a statement saying that the colonists were free from England and had the right to live, to be free, and to be happy. (Thomas Jefferson)
- This general fought England for American independence during the American Revolution. (George Washington)
- This man became the first president of the United States. (George Washington)
- This man became the third president of the United States. (Thomas Jefferson)
- This man known as "Honest Abe" was president during the U.S. Civil War and hid a paper under his hat that said all slaves were set free. (Abraham Lincoln)

Ask: "Which of these three presidents do you admire the most? What things have they done to make you feel this way?" Remember to repeat and expand upon each response, using richer

d more complex language, including, if possible, any read-alou cabulary. If a student's response includes inaccurate factual formation, refer back to earlier read-alouds and/or illustrations rrect any misunderstandings.

nal Connections

sk: What is a hero? Explain that heroes are people you admire spect, and look up to because they have done good things in heir lives.

Have students share who their heroes are. Ask what these people have done to cause students to admire them so much. Tell the students that today they will be listening to a story abo another one of the past presidents of the United States, Presid Theodore Roosevelt. Explain to the students that, during the r aloud, they will hear about one of President Roosevelt's heroe

ose for Listening

Tell students to listen for the struggles that Roosevelt had as child, and how he overcame those problems as he became a adult. Ask students to identify Theodore Roosevelt's hero and hero of Theodore Roosevelt's father.

Presenting the Read-Aloud — *10 minutes*

Teddy Roosevelt's Hero

Show image 7A-1: Theodore Roosevelt

Everybody gets scared sometimes, but we can learn what to do about it. Today we are going to hear a true story about someone who decided that he would never let being scared stop him from doing what was right. This is a story about young Teddy Roosevelt.

His mother called him "Theodore" when she introduced him to her friends. His own friends called him "T. R." for short. His father called him "Teddy" when saying something he especially wanted his son to remember. "Teddy," he might say, "there is nothing more important than a good **education,**" and Teddy Roosevelt would listen. [1] Teddy always listened to what his father said.

1 An education is what someone has learned.

Show image 7A-2: Young Teddy watches Lincoln's funeral train [2]

One day when Teddy was six years old, he and his younger brother, Elliott, were visiting their grandparents in New York City, where all the Roosevelt family lived. Teddy's friend, Edith Carow (CARE-oh), was with them, but the children were not playing as they usually did. They stood by a window with Mr. Roosevelt, Teddy's father, and watched a train slowly moving by, not far from the house. Mr. Roosevelt said, "Inside that train is Abraham Lincoln, the president of the United States. President Lincoln died, and that train is taking him back to his home for his funeral." [3]

2 Describe what you see in the picture.

3 A funeral is when people gather to honor someone who has died.

Teddy asked, "Why is the train moving so slowly, Father?"

"A lot of people loved Abraham Lincoln, Teddy, and thought he was a very good man. [4] People are sorry he died. They want Lincoln's family to know this, and they are gathering along the train tracks to show how much they will miss him." [5]

4 Who remembers something good that Abraham Lincoln did?

5 People are gathering out of respect for Abraham Lincoln. They want to say good-bye.

Show image 7A-3: Lincoln

Teddy thought about this. "Do *you* think Pres
a good man, Father?" Teddy greatly admired his
wanted to know how his father felt about the pre

6 Does it sound like Mr. Roosevelt admired President Lincoln? Why or why not?

Mr. Roosevelt replied, "I think Abraham Lincol
man, Teddy, and a great president. A great presi
of people and do a lot of good things. Abraham L
a poor family, but he worked hard. He was smart
so many people liked him that he was elected pre
remember, Teddy, you should **judge** [7] a man not b
clothes he wears or whether he lives in a fancy pa
by what he tries to do and why. Why, some of the best
have known hardly had two pennies to rub together." [8]

7 or form an opinion about

8 What do you think it means that someone "hardly had two pennies to rub together"? Teddy's father is saying that some of the best people he has known have been poor.

Show image 7A-4: Frail Teddy Roosevelt

But Teddy Roosevelt rarely got out to meet different k
people in different parts of town. Mostly he stayed quietl
because he had medical problems that made it hard for h
breathe. His mother worried that if he tried to be too activ
might get sick and die. [9] His father thought differently. "Te
said, "only you can decide how you will live. I suggest you
your body instead of being afraid to push it too hard. Look
the eye and tell it, 'I will not let you beat me. I will not just s
watch while other people do all the important and exciting
will truly *live* my life!'"

(Point to Teddy's mother in the picture and note how she is peeking in on him because she is worried about him.)

Show image 7A-5: Active Teddy Roosevelt

Teddy listened. Through years of long, hard effort, he turned
himself into someone who was all action. He built up his body
lifting weights, becoming a strong swimmer and learning to wr
and box. He spent more and more time outdoors, climbing high
mountains, hiking for miles and miles, and fishing and hunting.

followed his father's advice. does this suggest to you how Teddy felt about his

Teddy built up his mind, too. His love for the outdoors led
him to learn all about wild animals, birds, and fish. He became
such an **expert** [11] that famous scientists said, "Young Roosev

eone who knows a lot about ct

rried a young woman named Alice Lee. He studied to become a lawyer and wrote a book about the U.S. Navy, which navy officers agreed was the best book on the subject. Then he started to work in the government of the state of New York. Always doing a doz projects at once, he did all of them well.

Four years after Theodore and Alice married, Alice gave b to a baby girl, whom they named Alice. Theodore had never so happy. He loved his wife and new daughter and was now of the New York government leaders, doing work he knew wa helping people. Only two days after little Alice was born, how Theodore's lovely young wife became sick and died.

Show image 7A-7: Roosevelt out West

Heartbroken, Teddy asked his older sister, Anna, to care fo new baby. Then he left New York and traveled to South Dako land of wide-open prairies. [12] He bought a cattle ranch, work alongside the cowboys he hired to move herds of cattle, tryin to stay too busy to think about his sadness. There he began feel healthy again. He wrote, "My ranch-house stands on the brink. From the low, long veranda, shaded by leafy [trees], or looks across [to grassy] meadowland, behind which rises a line of [steep] cliffs. This . . . is a pleasant place in . . . summer evenings when a cool breeze stirs along the river and blows in the faces of the tired men, who [lean] back in their rocking-chairs [what true

12 Back then, far west of New York, there was much open land and many cowboys.

people I

inds of
y at home
him to
ve, he
ddy," he
u build up
k fear in
sit and
things. I

d
by
estle
h
10

e
elt

77

American does not enjoy a rocking-chair?], books in
gazing sleepily out at the [hills] in the after-glow of s

➡ **Show image 7A-8: Roosevelt the cowboy**

However, Teddy did not look quite like other cowb
wore glasses, and his cowboy outfit had been made
clothing designer back East. He also served as a de
special kind of policeman—while living in the West.
chased three outlaws[13] for days before catching an
them.

13 or people who had broken the law

➡ **Show image 7A-9: Roosevelt as a young politician**

Teddy loved the West, but little Alice was in the E
his daughter, so at last he went home. He decided, "
right. If such a terrible thing as losing my wife can ha
warning, I must use every day I have in this world to do important
things." He started working in government again so he could help
people. Theodore Roosevelt did not know it then, but he himself
would one day become president of the United States.

Discussing the Read-Aloud ***15*** *minutes*

Comprehension Questions (10 minutes)

1. Who was Teddy Roosevelt's hero as a child? (his father)
2. Why did Teddy's father admire Abraham Lincoln? (Lincoln came from a poor family, worked hard, was a good leader, and was a kind, honest man.)
3. What was Teddy's problem as a child? (He had medical problems that made it hard for him to breathe.)
4. What do you think gave Teddy the courage to build up his body and mind, even though he was a sick child? (the love and support of his father)
5. What kinds of things did Teddy do because he enjoyed the outdoors? (climbed mountains; hiked; hunted; fished; learned about wildlife; etc.) What kinds of things do you enjoy outdoors? (Answers may vary.)

6. *Think Pa*
Roosevel
president

Word Work: Expe

1. In the read-aloud today, we heard that Teddy Roose
became an *expert* in the outdoors and about animals
2. Say the word *expert* with me.
3. An expert is someone who knows a lot about a topic.
4. Someone is an expert if he or she knows how to do so
very well or can answer most questions about a topic.
5. Tell about someone you know who is an expert in some
Try to use the word *expert* when you tell about it. (Ask tw
or three students. If necessary, guide and/or rephrase the
students' responses: "One person I know who is an expe
___. S/he is an expert in ___.")
6. What's the word we've been talking about?

Use a *Making Choices* activity for follow-up. Directions: I am go
to describe some people. If any of the people I describe sound
like an expert, say, "expert." If any of the people I describe don't
sound like an expert, say, "not an expert."

1. someone who can answer all your questions about any type of bird (expert)
2. someone who is just beginning to learn to read (not an expert)
3. someone who takes apart a watch, but cannot put it back together again (not an expert)
4. someone who knows how to fix any problem with any computer (expert)

Complete Remainder of the Lesson Later in the Day

7B Teddy Roosevelt's Hero

Extensions

Image Review

Show images 7A-1 through 7A-9. Have the students t
what they see in each picture and what they have lea
is associated with the picture. As the students share,
to repeat and expand upon each response using rich
more complex language, including, if possible, any r
vocabulary.

Parent Letter

Send home Instructional Master 7B-1.

Learning to Teach Nothing in Particular

A Uniquely American Educational Dilemma

By David K. Cohen

When inspectors visit construction sites to assess the quality of work, they do so against the building code, which typically is written out in detail and used to guide work and teach apprentices. When attending physicians supervise interns as they take patients' histories or check their blood pressure, they compare the interns' work with established procedures, many of which are written down and used to guide work and teach novices. In these cases and many others, the assessment of quality in workers' performance is framed by and conducted in light of occupational standards.

That is not the case for teaching in U.S. K–12 schools. There are no common standards against which teachers' performance could be judged and no inspections of their performance in light of such standards. There have been standards of a sort (i.e., checklists of questionable quality), but they have not focused on performance in sufficient detail to discriminate acceptable from unacceptable work. If we want to understand teacher preparation, development, and assessment in the United States, we must explain this unusual situation.

Because local control and weak government were the foundations of U.S. public education, most of our school systems never developed the common instruments that are found in many national school systems (and, to be fair, in a few U.S. subsystems).

David K. Cohen is the John Dewey Collegiate Professor of Education and professor of public policy at the University of Michigan. He is the author of numerous articles and books on topics including education policy, the evaluation of educational experiments and large-scale interventions, and how to improve teaching. *This article is adapted with permission from "Teacher Quality: An American Educational Dilemma," a chapter in* Teacher Assessment and the Quest for Teacher Quality: A Handbook, *edited by Mary M. Kennedy,*

ILLUSTRATIONS BY SCOTT McKOWEN

These include a common curriculum or curriculum frameworks, common examinations tied to the curriculum, teacher education grounded in learning to teach the curriculum that students are to learn, and a teaching force whose members succeeded in those curriculum-based exams as students, among other things. Teachers who work with such infrastructure have instruments that they can use to set academic tasks tied to curriculum and assessment. They have a common vocabulary with which they can work together to identify, investigate, discuss, and solve problems of teaching and learning. Hence, they can have professional knowledge and skill, held in common.

The existence of such infrastructure does not ensure excellent or effective education; that depends on how well it is designed and how educators use it. Use can be influenced by agencies that oversee practice and shape quality; the chief example is inspectorates, whose staff visit schools and classrooms, assess quality, offer advice, and help to improve practice. Use also can be influenced by standards for entry to the occupation, requirements for education and training, and criteria for promotion. In some national systems, promotion and tenure depend on the demonstration of competent practice in the classroom.

One other salient feature of such infrastructure is that it can inform assessment of teaching. Given a common curriculum and teacher education grounded in the curriculum, it is possible to devise standards of teaching quality that are referenced to teaching that curriculum. It is possible to devise standards that specify which elements of the subject should be taught, when or in what order they might most fruitfully be taught, and even how they can be taught more or less well. It is also possible to create standards for students' performance that are grounded in the curriculum.

Because there is no common infrastructure for U.S. public education,* it has developed several anomalous features. One of the most important concerns testing: because there is no common curriculum, it is impossible to devise tests that assess the extent of students' mastery of that curriculum. So, even though we've been testing student learning for nearly 100 years, only isolated programs (such as Advanced Placement and International Baccalaureate) have tested whether students learned what they were supposed to have been taught. In the early 1900s, when E. L. Thorndike and his colleagues and students invented tests of students' academic performance, they devised tests that were designed to be independent of any particular curriculum. Nonetheless, those tests, and more recently developed similar tests, were and are used to assess students' progress in learning. That has to rank as one of the strangest creations in the history of education.†

Teacher education is a second anomaly: absent a common curriculum, teachers-in-training could not learn how to teach it, let alone how to teach it well. Hence, teacher education consists of efforts to teach future teachers to teach no particular curriculum. This is very strange, since to teach is always to teach something, but the governance structure of U.S. education has long forbidden the specification of what that something would be. For the most part, teacher education has been accommodating: typically, teacher candidates are taught how to teach no particular version of their subjects. That arrangement creates no incentives for those training to be teachers to learn, relatively deeply, what they would teach, nor does it create incentives for teacher educators to learn how to help teacher candidates learn how to teach a particular curriculum well. Instead, it offers incentives for them to teach novices whatever the teacher educators think is interesting or important (which often is not related to what happens in schools) or to offer a generic sort of teacher education. Most teachers report that, after receiving a teaching degree, they arrived in schools with little or no capability to teach particular subjects.

To teach is always to teach something, but the governance structure of U.S. education has long forbidden the specification of what that something would be.

Textbooks have developed along similar lines. Absent guidance from an established curriculum, or even, until very recently, standards or curriculum frameworks, publishers have had incentives to produce texts that cover anything that *might* be taught in a given subject and grade. As knowledge accumulated and conceptions of how it might be taught grew more diverse, textbooks grew as well; some now far exceed what could be dealt with seriously in a year.

Many efforts to write academic standards have followed this pattern: standards have grown to include such a range of topics that no teacher or school system could possibly deal with all or even most of what was included. Two agencies have studied stan-

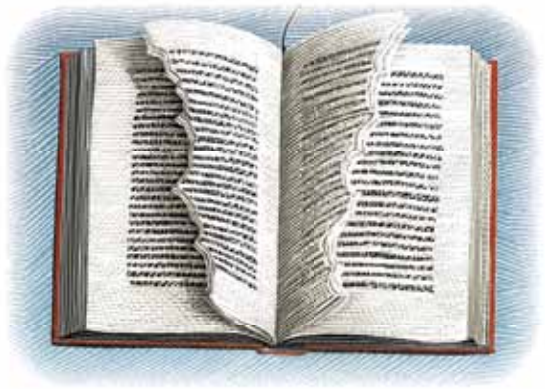
*Some elements of this infrastructure are found in some U.S. subsystems. One example is the Advanced Placement (AP) program in secondary schools. AP courses have common curriculum frameworks and common examinations, and students' AP exam scores can make a difference for college admission and course placement. But the AP program has never used these elements for teacher assessment.

†For a recent discussion of the consequences of such tests, see "What Bernie Madoff Can Teach Us about Accountability in Education," by Walter M. Stroup in the March 18, 2009, issue of *Education Week*.

dards, the Thomas B. Fordham Institute and the American Federation of Teachers. Both strongly support standards-based reform, but both have found most standards to be mediocre at best. Absent a common curriculum, educators, publishers, and interested others have no incentive to limit themselves to what is usable in common; rather, they have incentives to include what might be used somewhere by some significant segment of the profession or market.

One result of these developments, evident in several cross-national assessments, is a distinctive U.S. approach to textbooks and many academic standards: they are a mile wide and an inch deep. Many topics are "covered," but quickly and superficially. Students' knowledge and academic skills are thin compared with students from other nations that have a common curriculum and do *not* organize schooling around generic teaching, learning, and testing.[1]

How can teaching quality be assessed when there is no common curriculum, no agreement on what should be taught?



Standards of Teaching Quality

Lacking an educational infrastructure to rely on, teacher assessment has also been generic, as have standards for the colleges and departments of education that educate teachers. The National Council for Accreditation of Teacher Education (NCATE) is the chief organization that sets standards to accredit education schools and departments, and so it *tried* to set standards of teaching. But the result is uninspiring. For instance, the NCATE standard for reading, writing, and oral language in programs of elementary education is: "Elementary teachers demonstrate a high level of competence in use of English language arts, and they know, understand, and use concepts from reading, language, and child development to teach reading, writing, speaking, viewing, listening, and thinking skills and to help students successfully apply their developing skills to many different situations, materials, and ideas."[2]

Every term in that one-sentence standard requires definition in order to be useful for any purpose, including mere understanding, but no definitions are offered. NCATE does, however, refer readers who seek explanation to the "Elementary Education Standards and Supporting Explanation" devised and published by the Association for Childhood Education International (ACEI). Although ACEI offers a "supporting explanation" of the NCATE standard for reading, writing, and oral language, it is only a little less generic. In several paragraphs, one of its most specific statements is still quite vague: "Candidates teach children to read with a balanced instructional program that includes an emphasis on use of letter/sound relationships (phonics), context (semantic and syntactic), and text that has meaning for students."[3]

These NCATE/ACEI standards nicely exemplify the American educational dilemma: how to set standards for teaching when the essential element, the curriculum to be taught, is nowhere to be found. The result is a generic recitation of processes and topics, with references to "competence" and "balance," that lack any educational content. One cannot say that these standards are wrong, for they are too generic to be right or wrong. But one also cannot say that they offer more than the most vapid guidance for quality in teaching reading, writing, and oral language in elementary schools. Such standards offer little that might inform teacher assessment. They do, however, prompt the key question for teacher assessment in the United States: how can teaching quality be assessed when there is no common curriculum, no agreement on what should be taught? This is the educational equivalent of asking how the quality of plumbing could be judged absent the building code that sets out standards for the quality of materials and operations.

For most of our history, those responsible for schools and school systems answered this question in ways that were more political than educational: states and localities set their own standards for teaching quality, using methods and measures they deemed appropriate. That was consistent with the disjointed systems that Americans invented to govern public education, and with the absence of any educational infrastructure that could inform standards of quality. For the most part, states and localities have sought to regulate educational quality based on crude measures of school inputs. Recent efforts to graft outcome-oriented approaches to the assessment of teaching quality onto that crude system are a mismatch. Among other things, they rely on tests that testing experts have long been telling us were *not* designed to assess the quality of teaching.

There are serious technical problems to improved assessment of quality in teaching, but the central problems are not technical. They are political and educational. Public education in the United States lacks the elements of a viable system with which to assess the quality of teaching, including a common curriculum, common criteria of performance in teaching tied to the curriculum, and, therefore, the capability to inspect and improve teaching. There are serious technical problems in the construction of a

(Continued on page 54)

Testing What Has Been Taught

Helpful, High-Quality Assessments Start with a Strong Curriculum

By Laura S. Hamilton

In recent years, standardized, large-scale tests of student achievement have been given a central role in federal, state, and local efforts to improve K–12 education. Despite the widespread enthusiasm for assessment-based reforms, many of the current and proposed uses of large-scale assessments are based on unverified assumptions about the extent to which they will actually lead to improved teaching and learning, and insufficient attention has been paid to the characteristics of assessment programs that are likely to promote desired outcomes. Moreover, advocates of assessment-based reform often hold unrealistic expectations for what these assessments can and cannot do.

In light of the recently developed Common Core State Standards and the ongoing work to develop assessments aligned to those standards, now is a good time to pause and consider our state and federal assessment policies. If we are to actually improve schools, researchers and policymakers must address a few essential questions: How many purposes can one assessment serve? Can assessments meaningfully be aligned to standards, or is something more detailed, like a curriculum, necessary to guide both teachers and assessment developers? What would the key features of an assessment system designed to increase student learning and improve instruction be? While current assessment knowledge is not sufficient to fully answer these questions, in this article I offer an overview of what is known and several suggestions for improving our approach to assessment.

Purposes of Assessment

Large-scale assessments of student achievement are currently being used to serve a number of purposes in K–12 education. Broadly speaking, these purposes can be described as focusing

Laura S. Hamilton is a senior behavioral scientist with the RAND Corporation and an adjunct associate professor in the University of Pittsburgh's Learning Sciences and Policy program. She has directed several large studies, including an investigation of the implementation of standards-based accountability in response to No Child Left Behind. She is currently working with the National Center on Performance Incentives to investigate teachers' responses to pay-for-performance programs, and she serves on the committee that is revising the Standards for Educational and Psychological Testing.

ILLUSTRATIONS BY PAUL ZWOLAK

on providing information, imposing accountability, or some combination of the two. Increasingly, policymakers and others are placing multiple demands on large-scale testing programs to serve a wide variety of information and accountability purposes, and to inform decision making and induce change at different levels of the education system. Unfortunately, tests are seldom designed to address multiple purposes at once. Policymakers and the public must recognize that when a test designed for one purpose (e.g., to identify students' strengths and weaknesses in algebra) is used for another purpose (e.g., to decide which students will be promoted to ninth grade or which teachers will receive bonuses), the resulting test scores may not provide valid information for both purposes. The use of the test to make decisions for purposes other than those for which it was validated is generally unwarranted.[1]

Research indicates that teachers and other staff reallocate time and resources toward tested content.

Efforts to validate large-scale assessments are not able to keep pace with the public policies expanding their use. Though many policymakers are not heeding researchers' warnings, there is evidence that most such assessments may not be serving *any* of their purposes adequately. At the classroom level, teachers tend to find that most accountability-focused tests are less useful than other information (such as homework, teacher-developed tests, or classroom observations) for informing instruction. In addition, the attachment of high stakes to existing tests has led to unintended and probably undesirable consequences (discussed below).

The Effects of High-Stakes Testing

Because much of today's policy debate focuses on externally mandated assessments for use as tools of accountability, we can apply lessons learned from the past few decades, when accountability testing became nearly ubiquitous in public K–12 education. In brief, research (conducted by various individuals and organizations across numerous districts, states, and nations) indicates that teachers and other school and district staff reallocate resources (including time) toward tested content and away from untested content.[2] This reallocation occurs across subjects, across topics within subjects, and even across students when the performance of some students counts more than that of others for accountability purposes (e.g., some schools have provided extra help to students just below the cut score for proficient).[3]

The form of resource reallocation that has probably generated the most concern is the excessive emphasis on test-taking skills; it consumes time that should be spent teaching content. However, this is not the only form, and may not even be the most common. Reallocation also takes the form of increases in time spent engaging in instructional activities that are directed toward what is tested and how it is tested—such as focusing on short reading passages with closed-ended comprehension questions—and decreases in time spent on activities that are not tested—such as reading novels or writing extended essays. Because most large-scale tests rely on multiple-choice items or other formats that tend to emphasize discrete skills and knowledge rather than complex, extended problems, reallocation is likely to reduce the amount of class time and resources devoted to these more complex skills and processes.*

Reallocation is often thought of as something teachers do, but the decisions that lead to reallocation are often made at higher levels of the education system. Teachers report drawing on a variety of instructional resources (such as curriculum and pacing guides, test-preparation materials, professional development, and mandatory interim assessments), and school, district, and state administrators often design these resources to emphasize tested content.[5] Worse, these resources are not always well aligned or designed in ways that promote high-quality instruction. For example, while some teachers have access to high-quality formative assessment systems that are linked to their local curricula and provide clear guidance for next steps, others obtain their interim data from mandatory assessments that do not provide formative feedback and may not be well aligned with what they are teaching.

The key lesson of all this research is that *what is tested influences what is taught, in significant and sometimes unexpected, problematic ways*. For example, one well-documented problem is score inflation. Scores on high-stakes tests tend to increase much more rapidly than scores on low- or no-stakes tests, as educators alter their instruction to better prepare students for the high-stakes test. Some of these score increases are legitimate and welcomed; some are the result of anything from drilling in test-taking strategies to outright cheating. The term "score inflation" refers to any score increase that is not caused by an increase in students' learning of the skills and knowledge that the test is intended to measure.

Since at least the 1980s, one popular "solution" to the sometimes negative influence of testing on teaching has been calls for "tests worth teaching to," based on the notion that if tests were of high quality and measured complex skills and process, instruction would follow suit. This idea resulted in the wave of performance-based assessments in the 1990s. Evidence from some states' performance-based assessment programs suggests that these assessments can lead to some of the desired outcomes, such as increased emphasis on problem solving,[6] but for the most part these efforts have failed to lead to fundamental changes in how teachers deliver instruction.[7] Most states have backed away

*It is worth pointing out that the findings regarding reallocation in response to high-stakes performance measures are not limited to education. They have been observed in sectors as varied as health care, transportation, and emergency preparedness.[4]

from performance-based assessment because of costs and technical problems (e.g., states that implemented portfolio assessments found that scoring tended to be inconsistent and expensive[8]). Moreover, evidence suggests that simply adopting performance-based assessment does not eliminate the problems of narrowing what is taught or score inflation.[9] Although some have claimed that the Advanced Placement (AP) and International Baccalaureate (IB) programs might be considered successful implementations of the idea of tests worth teaching to, both of those programs' exams are aligned to well-defined course content. So, while their tests are generally high in quality and doing well on these tests is a legitimate goal of AP and IB courses, the key to these programs appears to be well-aligned instructional materials and assessments—not assessments alone.

This brings us to another popular "solution": standards. A number of factors have contributed to the appeal of standards-based teaching. One of these may have been the negative influence of high-stakes testing as a result of the minimum-competency testing movement. Standards may have seemed like a logical way to counter the narrowing of the curriculum and emphasis on lower-order, tested skills and content. However, efforts to promote more cognitively demanding instruction by building complex skills and knowledge into state or district content standards have been thwarted by the very tests used to assess those standards. Most states claim that their assessments are aligned with their standards, but these ostensibly aligned tests often sample only a subset of the standards,† with disproportionate emphasis on the lower-level content that is easier to test.[10] Because standards and high-stakes tests are not fully aligned, educators understandably tend to rely more on the tests than on the standards for instructional guidance.[11]

After 20 years of trying to align standards and tests, it is time to question whether this is even possible—at least in a meaningful way. Most standards are not highly specific or detailed. Typically, they are broad outcome statements that are wide open to interpretation. Assessments, however, are highly specific and detailed. Herein lies the problem with assessments aligned to standards: a teacher may faithfully and effectively teach to the standards all year and her students may learn a great deal, but her students may still do poorly on the test simply because the teacher and the test developer interpreted the standards differently. A curriculum, by specifying what knowledge and skills to teach and to test, could reduce the severity of this problem.

Clearly, assessment-based reforms (1) have not fully achieved policymakers' goals, and (2) have led to unintended consequences. These findings raise concerns about the extent to which assessment can be viewed as a means for improving educational outcomes. At the same time, assessment clearly plays an important role in providing information that helps teachers and other educators improve. Moreover, because testing affects what is taught, assessment has the potential to contribute to positive educational change *if* it is designed and implemented appropriately.

†Another problem is the low quality of the standards themselves, which tend to be either too vague to guide instruction or too detailed to be covered in one school year. For more on the problems with most states' standards, see the Spring 2008 issue of *American Educator*, available at www.aft.org/newspubs/periodicals/ae/spring2008.

Building a Better Assessment System

There is no research evidence to tell us definitively how to build an assessment system that will promote student learning and be resistant to the negative consequences that are common in high-stakes testing programs. One promising approach is to start with a detailed, coherent curriculum that is aligned with rigorous content standards, and then build an assessment system that measures the skills and knowledge emphasized in the curriculum. (Of course, using curriculum to guide assessment development would require a more consistent curriculum policy than currently exists in our states, a topic discussed throughout this issue of *American Educator*.) While it's inevitable that assessment will continue to drive instructional decisions, the less desirable consequences may be mitigated by providing educators with a high-quality curriculum and a set of supports like sample lesson plans and quizzes, ongoing professional development, and more time to confer with colleagues. Ensuring that all the components are well aligned should give teachers confidence that if they teach the curriculum effectively, the result will be improved student learning as measured by the assessments.

While assessment will continue to drive instruction, the consequences may be mitigated by providing educators a high-quality curriculum and supports like sample lesson plans and time to confer with colleagues.

The tendency to engage in practices that narrow the curriculum and cause score inflation stems in large part from a belief among educators that delivering the entire existing curriculum (or standards, in districts and schools that do not have a curriculum) will not ensure adequate coverage of the tested material. Teachers and principals understand that many aspects of their curricula/standards are not included on the accountability tests and that some of the tested material is not included in the curricula/standards (at least for that grade level).[12] A better-aligned system, modeled in part after the AP and IB programs (combined with some of the other suggestions discussed below), might help to assuage teachers' concerns about coverage and enable them to worry less about what is likely to be on the test.

This idea is not inconsistent with earlier notions of standards-based reform,[13] which advocated for alignment among not just standards and assessment, but standards, assessment, curriculum, and professional development. Many advocates of standards-based reform argued that standards should drive the development of *both* the curriculum and the assessments. While this makes sense in theory, in practice most standards are not written at a level of specificity that promotes the development of aligned curricula or assessments.[14] To date, no state has even

There's No Such Thing as a Reading Test

BY E. D. HIRSCH, JR., AND ROBERT PONDISCIO

It is among the most common of nightmares. You dream of taking a test for which you are completely unprepared—you've never studied the material or even attended the course. For millions of American schoolchildren, it is a nightmare from which they cannot wake, a trial visited upon them each year when the law requires them to take reading tests with little preparation. Sure, formally preparing for reading tests has become more than just a ritual for schools. It is practically their raison d'être! Yet students are not prepared in the way they need to be.

Schools and teachers may indeed be making a Herculean effort to raise reading scores, but for the most part these efforts do little to improve reading achievement and prepare children for college, a career, and a lifetime of productive, engaged citizenship. This wasted effort is not because our teachers are of low quality. Rather, too many of our schools have fundamental misconceptions about reading comprehension—how it works, how to improve it, and how to test it.

Reading, like riding a bike, is typically thought of as a skill we acquire as children and generally never lose. When you think about your ability to read—if you think about it at all—the chances are good that you perceive it as not just a skill, but a readily transferable skill. Once you learn how to read, you can competently read a novel, a newspaper article, or the latest memo from your bank. Reading is reading is reading. Either you can do it, or you cannot.

As explained in the articles on pages 3 and 30, this view of reading is only partially correct. The ability to translate written symbols into sounds, commonly called "decoding," is indeed a skill that can be taught and mastered. This explains why you are able to "read" nonsense words such as "rigfap" or "churbit." But to be fully literate is to have the communicative power of language at your command—to read, write, listen, and speak with *understanding*.

Cognitive scientists describe comprehension as domain specific. If a baseball fan reads "A-Rod hit into a 6-4-3 double play to end the game," he needs not another word to understand that the New York Yankees lost when Alex Rodriguez came up to bat with a man on first base and one out and then hit a ground ball to the shortstop, who threw to the second baseman, who relayed to first in time to catch Rodriguez for the final out. If you've never heard of A-Rod or a 6-4-3 double play and cannot reconstruct the game situation in your mind's eye, you are not a poor reader. You merely lack the domain-specific vocabulary and knowledge of baseball needed to fill in the gaps. Even simple texts, like those on reading tests, are riddled with gaps—domain knowledge and vocabulary that the writer assumes the reader knows.

Think of reading as a two-lock box, requiring two keys to open. The first key is decoding skills. The second key is vocabulary sufficient to understand what is being decoded. Reading comprehension tests are basically vocabulary tests. The verbal portion of the SAT is essentially a vocabulary test. The verbal section of the Armed Forces Qualification Test—which predicts income level, job performance, and much else—is chiefly a vocabulary test. So, to lift us out of our low performance compared with other nations, narrow the achievement gap between groups, and offer low-income students a way out of poverty, all we need to do is greatly increase students' vocabularies. That's it.

Sounds great, but it is misleadingly facile, since vocabulary size is increased only trivially by explicit word study, and most word learning is slow and imperceptible. But, as Marilyn Jager Adams has shown (see page 3), it is much faster when teachers stay on a topic long enough to inculcate new knowledge, thereby creating a familiar context for learning new words. As a result, *the only road to a large vocabulary is the gradual, cumulative acquisition of knowledge*. Our minds are so formed that we can rarely know things without knowing the words for them, nor can we know words without knowing the

E. D. Hirsch, Jr., is the founder of the Core Knowledge Foundation and professor emeritus at the University of Virginia. His most recent book is The Making of Americans: Democracy and Our Schools. *Robert Pondiscio is a former fifth-grade teacher; he writes about education at* The Core Knowledge Blog. *Adapted with permission from E. D. Hirsch, Jr., and Robert Pondiscio, "There's No Such Thing as a Reading Test,"* American Prospect *21, no. 6 (June 2010), www.prospect.org.*

developed a statewide curriculum, much less based its assessment on a curriculum.

Even if a superb curriculum and well-aligned, high-quality assessment had been developed, our work would not be done. A sound accountability policy requires multiple sources of information and supports: not all of the outcomes that we want schools to promote can be measured easily or cheaply through large-scale assessments, and not all desired changes can be induced through improvements in assessment alone. Decision makers who understand the strong influence that high-stakes tests exert may, understandably, wish to rely heavily on assessment as a means to promote school improvement. For assessment to serve this role effectively, it must be designed in a way that supports rather than detracts from teachers' efforts to engage in high-quality instruction. Research on the effects of various assessment-design features is limited, so any effort that relies heavily on assessment as a tool for school improvement should be carried out with caution. Nonetheless, it is worth reviewing what is known and looks promising. Here are four approaches to designing assessment and accountability policies that are likely to support school improvement.

First, an accountability system that is designed to reward or penalize districts, schools, or individuals on the basis of their performance should not rely exclusively on tests. Although there is extensive research being conducted to guide improvements in large-scale testing, it is likely that society will continue to expect schools to promote outcomes (like critical thinking and responsible citizenship) that cannot be measured well using tests. In addition, even if the perfect assessments could be designed, it is not realistic to expect that it would be practical or desirable to

attributes of the things referred to. So there's just one reliable way to increase the vocabulary size of all students in a class: offer them a coherent, cumulative education starting in the earliest years (i.e., no later than kindergarten).

Today, *we test our children's reading ability without regard to whether we have given them the vocabulary and knowledge they need to be successful*. Consider a reasonable, simple, even elegant alternative: tying the content of reading tests to specific curricular content. Here's how it would work. Let's say a state (or the nation) adopted a specific, content-rich, grade-by-grade core curriculum. And let's say the fourth-grade science curriculum included the circulatory system, atoms and molecules, electricity, and the earth's geologic layers and weather. The reading test should include not just the fiction and poetry that were part of the English language arts curriculum, but also nonfiction readings on the specific science topics addressed in the science curriculum. And other passages on the reading test would be taken from topics specified in the core curriculum in other subjects.

The benefits of such curriculum-based reading tests would be many: Tests would be fairer and offer a better reflection of how well a student had learned the particular year's curriculum. Tests would also exhibit "consequential validity," meaning they would actually improve education. Instead of wasting hours on mind-numbing test prep and reading-strategy lessons of limited value, the best test-preparation strategy would be learning the material in the curriculum.

By contrast, let's imagine what it is like to be a fourth-grade boy in a struggling South Bronx elementary school, sitting for a high-stakes reading test. Because his school has large numbers of students below grade level, it has drastically cut back on science, social studies, art, music—even gym and recess—to focus on reading and math. He has spent much of the year practicing reading-comprehension strategies.

The test begins, and the very first passage concerns the customs of the Dutch colony of New Amsterdam. He does not know what a custom is; nor does he know who the Dutch were, or even what a colony is. He has never heard of Amsterdam, old or new. Certainly it has never come up in class. Without relevant vocabulary and knowledge, he struggles. Extra drilling in comprehension strategies would not help—he needs someone to teach him about New Amsterdam.

His low score comes in and the finger-pointing that plagues American education begins. But do not blame the tests. Taxpayers are entitled to know if the schools they support are any good, and reading tests, all things considered, are quite reliable. Do not blame the test writers. Since no state has adopted a common core curriculum, they have no idea what topics are being taught in school; their job is done when tests show certain technical characteristics. It is unfair to blame teachers, because they are mainly operating to the best of their abilities using the ineffective methods in which they were trained. And let's not blame the parents of our struggling young man in the South Bronx. Is it unreasonable for them to assume that a child who dutifully goes to school every day will gain access to the same rich, enabling vocabulary and knowledge that more affluent children take for granted? This boy's parents did not decide to minimize social studies and science instruction, thereby minimizing the chances that he would have the vocabulary and knowledge needed to comprehend the passages on the reading test.

Teaching skills, vocabulary, and knowledge is what schools are supposed to do. The only unreasonable thing is our refusal to see reading for what it really is, and to teach and test accordingly. ❑

spend the time and money required to administer tests representing the full range of outcomes of interest. Accountability systems could supplement tests with non-test-based indicators of processes or outcomes, such as college-preparatory course taking, high school and college graduation rates, and apprenticeship completion rates. And, these systems could be designed in concert with current efforts by several teams of researchers and practitioners to develop improved test and nontest measures of teaching quality. When we look beyond tests alone to meet our information and accountability needs, a wide range of better options become available.

Of course, any supplemental measure should be evaluated using the same criteria for validity and reliability that are applied to test-based measures, and unintended consequences should be identified and addressed. One potential advantage of nontest indicators, such as peer and administrator observations and critiques of instruction, is that they might serve a more useful professional development function than test scores have, by providing teachers with clear, constructive feedback on their teaching. But if new measures (or rubrics) are used for both professional development and accountability purposes, investigations need to be designed to examine the validity of scores from those measures in light of each of those purposes, as well as the consequences that arise. Some problems, such as the tendency to focus on what is measured at the expense of what is not measured, are unlikely to be eliminated completely, so it will be important to monitor for undesirable consequences and modify the system as necessary to address them.

Second, for assessment and accountability to be useful, policymakers must consider ways to improve the quality of informa-

tion from the tests themselves, and to mitigate the expected negative effects of using tests for high-stakes purposes. In particular, designers of testing programs should take steps to reduce the likelihood of curriculum narrowing and score inflation. As mentioned above, basing the test on a detailed curriculum instead of broad standards will probably help. Another promising approach is to design tests to minimize predictability from one administration to another, so that focusing instruction on particular item formats or styles will not be viewed as likely means to raising scores. A single test administered at one point in time can sample only a fraction of the material in the curriculum, so varying this material over time, along with the types of items designed to measure it, should result in reduced curriculum narrowing and score inflation. In short, *if teachers had a high-quality curriculum and supporting materials at hand, and if the test were well-aligned but unpredictable, then teachers would probably just focus on helping all students master the skills and knowledge specified in the curriculum*. Of course, the problem of testing higher-order knowledge and skills would remain, but in the near future technology may offer new opportunities to design cost-effective and high-quality performance-based measures.[15]

When we look beyond tests alone to meet our information and accountability needs, a wide range of better options become available.

Third, any accountability system that seeks to support instructional improvement ought to include a high-quality formative assessment system—one that is aligned with the curriculum and provides clear instructional guidance rather than simply predicting students' scores on the state test.[16] But the assessment itself is just the beginning. The results must be accessible and available in a way that facilitates effective day-to-day use to guide instruction and be accompanied by ongoing professional development.

Finally, a number of other considerations need to be addressed when designing the testing components of an accountability policy, such as whether to focus the system on student or educator performance, on individual or group performance, on current achievement or growth, and on fixed targets or participant rankings.[17] These need not be such stark tradeoffs, but they do need to be considered. Many policymakers seem to want to say "All of the above," but such an unfocused and unwieldy accountability system would be very unlikely to promote school improvement.

Despite these challenges (and the dozens of more technical challenges that I have not addressed), it is likely that test-based accountability will be with us for some time. No doubt the policymakers who enthusiastically support such accountability are truly committed to school improvement—so they ought to see that heeding educators' and researchers' concerns about the purposes, meaningful uses, and technical limits of assessments is worthwhile. Working together, we can develop a program of large-scale assessment that addresses the information needs of educators, particularly at the classroom level, while also contributing to improved accountability policies. ❑

Endnotes

1. American Educational Research Association, American Psychological Association, and National Council on Measurement in Education, *Standards for Educational and Psychological Testing* (Washington, DC: American Psychological Association, 1999); and Michael T. Kane, "Validation," in *Educational Measurement*, 4th ed., ed. Robert L. Brennan (Westport, CT: American Council on Education/Praeger, 2006), 17–64.

2. For reviews of relevant literature, see Laura S. Hamilton, "Assessment as a Policy Tool," *Review of Research in Education* 27, no. 1 (2003): 25–68; Jane Hannaway and Laura S. Hamilton, *Accountability Policies: Implications for School and Classroom Practices* (Washington, DC: Urban Institute, 2008); and Brian M. Stecher, "Consequences of Large-Scale, High-Stakes Testing on School and Classroom Practice," in *Making Sense of Test-Based Accountability in Education*, ed. Laura S. Hamilton, Brian M. Stecher, and Stephen P. Klein (Santa Monica, CA: RAND, 2002).

3. See, for example, Jennifer Booher-Jennings, "Below the Bubble: 'Educational Triage' and the Texas Accountability System," *American Educational Research Journal* 42, no. 2 (2005): 231–268.

4. Brian M. Stecher, Frank Camm, Cheryl L. Damberg, Laura S. Hamilton, Kathleen J. Mullen, Christopher Nelson, Paul Sorensen, Martin Wachs, Allison Yoh, and Gail L. Zellman, *Toward a Culture of Consequences: Performance-Based Accountability Systems for Public Services* (Santa Monica, CA: RAND, 2010).

5. Laura S. Hamilton, Brian M. Stecher, Jennifer Lin Russell, Julie A. Marsh, and Jeremy Miles, "Accountability and Teaching Practices: School-Level Actions and Teacher Responses," in *Strong States, Weak Schools: The Benefits and Dilemmas of Centralized Accountability*, ed. Bruce Fuller, Melissa K. Henne, and Emily Hannum, vol. 16, *Research in Sociology of Education* (St. Louis, MO: Emerald Group Publishing, 2008), 31–66; and Brian M. Stecher, Scott Epstein, Laura S. Hamilton, Julie A. Marsh, Abby Robyn, Jennifer Sloan McCombs, Jennifer Russell, and Scott Naftel, *Pain and Gain: Implementing No Child Left Behind in Three States, 2004–2006* (Santa Monica, CA: RAND, 2008).

6. Suzanne Lane, Carol S. Parke, and Clement A. Stone, "The Impact of a State Performance-Based Assessment and Accountability Program on Mathematics Instruction and Student Learning: Evidence from Survey Data and School Performance," *Educational Assessment* 8, no. 4 (2002): 279–315.

7. John B. Diamond, "Where the Rubber Meets the Road: Rethinking the Connection between High-Stakes Testing Policy and Classroom Instruction," *Sociology of Education* 80, no. 4 (2007): 285–313; and William A. Firestone, David Mayrowetz, and Janet Fairman, "Performance-Based Assessment and Instructional Change: The Effects of Testing in Maine and Maryland," *Educational Evaluation and Policy Analysis* 20, no. 2 (1998): 95–113.

8. See Daniel Koretz, Brian M. Stecher, Stephen P. Klein, and Daniel McCaffrey, "The Vermont Portfolio Assessment Program: Findings and Implications," *Educational Measurement: Issues and Practice* 13, no. 3 (1994): 5–16.

9. Daniel Koretz and Sheila Barron, *The Validity of Gains in Scores on the Kentucky Instructional Results Information System (KIRIS)* (Santa Monica, CA: RAND, 1998).

10. Robert Rothman, Jean B. Slattery, Jennifer L. Vranek, and Lauren B. Resnick, *Benchmarking and Alignment of Standards and Testing* (Los Angeles: National Center for Research on Evaluation, Standards, and Student Testing, 2002).

11. Brian M. Stecher and Tammi Chun, *School and Classroom Practices during Two Years of Education Reform in Washington State* (Los Angeles: National Center for Research on Evaluation, Standards, and Student Testing, 2001).

12. Stecher et al., *Pain and Gain*.

13. Marshall S. Smith and Jennifer O'Day, "Systemic School Reform," in *The Politics of Curriculum and Testing: The 1990 Yearbook of the Politics of Education Association*, ed. Susan H. Fuhrman and Betty Malen (New York: Falmer Press, 1991), 233–267.

14. Heidi Glidden, "Common Ground: Clear, Specific Content Holds Teaching, Texts, and Tests Together," *American Educator* 32, no. 1 (Spring 2008): 13–19.

15. Edys S. Quellmalz and James W. Pellegrino, "Technology and Testing," Science 323, no. 5910 (2009): 75–79; and Bill Tucker, *Beyond the Bubble: Technology and the Future of Student Assessment* (Washington, DC: Education Sector, 2009), 1–9.

16. Marianne Perie, Scott Marion, Brian Gong, and Judy Wurtzel, *The Role of Interim Assessments in a Comprehensive Assessment System: A Policy Brief* (Washington, DC: Achieve, Aspen Institute, and National Center for the Improvement of Educational Assessment, 2007).

17. See, for example, Michael J. Podgursky and Matthew G. Springer, "Teacher Performance Pay: A Review," *Journal of Policy Analysis and Management* 26, no. 4 (2007): 909–950.

Advanced Texts

(Continued from page 11)

33. Nagy, Anderson, and Herman, "Learning Word Meanings."

34. Meredyth Daneman and Ian Green, "Individual Differences in Comprehending and Producing Words in Context," *Journal of Memory and Language* 25, no. 1 (1986): 1–18; Patricia A. Herman, Richard C. Anderson, P. David Pearson, and William E. Nagy, "Incidental Acquisition of Word Meaning from Expositions with Varied Text Features," *Reading Research Quarterly* 22, no. 3 (1987): 263–284; John L. Shefelbine, "Student Factors Related to Variability in Learning Word Meanings from Context," *Journal of Reading Behavior* 22, no. 1 (1990): 71–97; and Robert J. Sternberg and Janet S. Powell, "Comprehending Verbal Comprehension," *American Psychologist* 38, no. 8 (1983): 878–893.

35. Louise Morrison, "Talking about Words: A Study of French as a Second Language Learners' Lexical Inferencing Procedures," *Canadian Modern Language Review* 53, no. 1 (1996): 41–75; and Hossein Nassaji, "The Relationship between Depth of Vocabulary Knowledge and L2 Learners' Lexical Inferencing Strategy Use and Success," *Canadian Modern Language Review* 61, no. 1 (2004): 107–134.

36. Manuel G. Calvo, Adelina Estevez, and Margaret G. Dowens, "Time Course of Elaborative Inferences in Reading as a Function of Prior Vocabulary Knowledge," *Learning and Instruction* 13, no. 6 (2003): 611–631; and Nassaji, "Relationship."

37. Andrew Biemiller and Catherine Boote, "An Effective Method for Building Meaning Vocabulary in Primary Grades," *Journal of Educational Psychology* 98, no. 1 (2006): 44–62; Joseph R. Jenkins, Marcy L. Stein, and Katherine Wysocki, "Learning Vocabulary through Reading," *American Educational Research Journal* 21, no. 4 (1984): 767–787; and Claudia Robbins and Linnea C. Ehri, "Reading Storybooks to Kindergartners Helps Them Learn New Vocabulary Words," *Journal of Educational Psychology* 86, no. 1 (1994): 54–64.

38. National Reading Panel, *Teaching Children to Read: An Evidence-Based Assessment of the Scientific Research Literature on Reading and Its Implications for Reading Instruction; Reports of the Subgroups* (Washington, DC: National Institute of Child Health and Human Development, 2000).

39. Tenaha O'Reilly and Danielle S. McNamara, "The Impact of Science Knowledge, Reading Skill, and Reading Strategy Knowledge on More Traditional 'High-Stakes' Measures of High School Students' Science Achievement," *American Educational Research Journal* 44, no. 1 (2007): 161–196.

40. Filip Dochy, Mien Segers, and Michelle M. Buehl, "The Relation between Assessment Practices and Outcomes of Studies: The Case of Research on Prior Knowledge," *Review of Educational Research* 69, no. 2 (1999): 145–186; and Amy M. Shapiro, "How Including Prior Knowledge as a Subject Variable May Change Outcomes of Learning Research," *American Educational Research Journal* 41, no. 1 (2004): 159–189.

41. O'Reilly and McNamara, "The Impact of Science Knowledge."

42. See Steven A. Sloman, "The Empirical Case for Two Systems of Reasoning," *Psychological Bulletin* 119, no. 1 (1996): 3–22; and Steven A. Sloman, *Causal Models: How People Think about the World and Its Alternatives* (Oxford: Oxford University Press, 2005).

43. K. Anders Ericsson, Neil Charness, Robert R. Hoffman, and Paul J. Feltovich, eds., *The Cambridge Handbook of Expertise and Expert Performance* (Cambridge: Cambridge University Press, 2006).

44. E. D. Hirsch, Jr., *The Knowledge Deficit: Closing the Shocking Education Gap for American Children* (Boston: Houghton Mifflin, 2006).

45. Marilyn Jager Adams, "The Promise of Automatic Speech Recognition for Fostering Literacy Growth in Children and Adults," in *International Handbook of Literacy and Technology*, vol. 2, ed. Michael C. McKenna, Linda D. Labbo, Ronald D. Kieffer, and David Reinking (Hillsdale, NJ: Lawrence Erlbaum Associates, 2006), 109–128; and Marilyn Jager Adams, "The Limits of the Self-Teaching Hypothesis," in *Educating the Other America: Top Experts Tackle Poverty, Literacy, and Achievement in Our Schools*, ed. Susan B. Neuman (Baltimore: Paul H. Brookes, 2008), 277–300.

46. Carroll, Davies, and Richman, *The American Heritage Word Frequency Book*.

47. Michael Stubbs, "Language Development, Lexical Competence and Nuclear Vocabulary," in *Educational Linguistics*, ed. Michael Stubbs (Oxford: Blackwell, 1986), 98–115.

48. Patrick J. Finn, "Word Frequency, Information Theory, and Cloze Performance: A Transfer Feature Theory of Processing in Reading," *Reading Research Quarterly* 13, no. 4 (1977-1978): 508–537.

49. Anne E. Cunningham, "Accounting for Children's Orthographic Learning while Reading Text: Do Children Self-Teach?" *Journal of Experimental Child Psychology* 95, no. 1 (2006): 56–77.

50. David L. Share and Carmit Shalev, "Self-Teaching in Normal and Disabled Readers," *Reading and Writing: An Interdisciplinary Journal* 17 (2004): 769–800.

51. O'Reilly and McNamara, "The Impact of Science Knowledge"; and Shapiro, "Including Prior Knowledge."

52. Daneman and Green, "Individual Differences"; Herman et al., "Incidental Acquisition of Word Meaning"; Shefelbine, "Student Factors Related to Variability"; and Sternberg and Powell, "Comprehending Verbal Comprehension."

53. Biemiller and Boote, "An Effective Method for Building"; Jenkins, Stein, and Wysocki, "Learning Vocabulary through Reading"; Charles A. Perfetti, Edward W. Wlotko, and Lesley A. Hart, "Word Learning and Individual Differences in Word Learning Reflected in Event-Related Potentials," *Journal of Experimental Psychology: Learning, Memory, and Cognition* 31, no. 6 (2005): 1281–1292; and Robbins and Ehri, "Reading Storybooks to Kindergartners."

54. Walter J. Ong, *Orality and Literacy: The Technologizing of the Word*, 2nd ed. (New York: Routledge, 2002).

55. College Board, "2010 College-Bound Seniors Results Underscore Importance of Academic Rigor," press release, September 13, 2010, www.collegeboard.com/press/releases/213182.html.

High-Performing Nations

(Continued from page 23)

will include the more than $200 billion we now lose in wages, taxes, and social costs annually due to dropouts; the $50 billion we pay for lost wages and for incarceration tied to illiteracy and school failure; and the many tens of billions wasted each year on reforms that fail, fads that don't stick, unnecessary teacher turnover, avoidable special education placements, remedial education, grade retention, summer school, lost productivity, and jobs that move overseas.[16]

The path to our mutual well-being is built on educational opportunity. Central to our collective future is the recognition that our capacity to survive and thrive ultimately depends on ensuring for all of our people what should be an unquestioned entitlement—an inalienable right to learn. □

Endnotes

1. Clayborne Carson, ed., *The Autobiography of Martin Luther King, Jr.* (New York: Warner Books, 1998), 352.

2. John Aubrey Douglass, *The Waning of America's Higher Education Advantage: International Competitors Are No Longer Number Two and Have Big Plans in the Global Economy* (Berkeley, CA: Center for Studies in Higher Education, University of California at Berkeley, 2006); and Organisation for Economic Co-operation and Development (OECD), *Education at a Glance, 2007: OECD Indicators* (Paris: OECD, 2007).

3. N. C. Aizenman, "U.S. to Grow Grayer, More Diverse: Minorities Will Be Majority by 2042, Census Bureau Says," *Washington Post*, August 14, 2008.

4. Linda Darling-Hammond, "Standards, Accountability, and School Reform," *Teachers College Record* 106, no. 6 (2004): 1047–1085.

5. Jeannie Oakes, "Investigating the Claims in *Williams v. State of California*: An Unconstitutional Denial of Education's Basic Tools?" *Teachers College Record* 106, no. 10 (2004): 1889–1906.

6. Organisation for Economic Co-operation and Development (OECD), *PISA 2006: Science Competencies for Tomorrow's World* (Paris: OECD, 2007).

7. Howard L. Fleischman, Paul J. Hopstock, Marisa P. Pelczar, and Brooke E. Shelley, *Highlights From PISA 2009: Performance of U.S. 15-Year-Old Students in Reading, Mathematics, and Science Literacy in an International Context* (Washington, DC: National Center for Education Statistics, 2010).

8. Nam-Hwa Kang and Miyoung Hong, "Achieving Excellence in Teacher Workforce and Equity in Learning Opportunities in South Korea," *Educational Researcher* 37, no. 4 (2008): 203.

9. Kyung-chul Huh, *Understanding Korean Education: Volume 1, School Curriculum in Korea* (Seoul: Korean Educational Development Institute, 2007), 46.

10. Pasi Sahlberg, "Education Policies for Raising Student Learning: The Finnish Approach," *Journal of Education Policy* 22, no. 2 (2007): 147–171.

11. Friedrich Buchberger and Irina Buchberger, "Problem Solving Capacity of a Teacher Education System as Condition of Success? An Analysis of the 'Finnish Case,'" www.see-educoop.net/education_in/pdf/workshop/tesee/dokumenti/erasmus2003-oth-enl-t03.pdf.

12. "National Curriculum and Evaluation," Korea Institute for Curriculum and Evaluation, accessed November 16, 2006, www.kice.re.kr/kice/eng/info/info.2.jsp; and Max A. Eckstein and Harold J. Noah, *Secondary School Examinations: International Perspectives on Policies and Practice* (New Haven, CT: Yale University Press, 1993).

13. Karl L. Alexander and Edward L. McDill, "Selection and Allocation within Schools: Some Causes and Consequences of Curriculum Placement," *American Sociological Review* 41 (1976): 963–980; Adam Gamoran, "The Consequences of Track-Related Instructional Differences for Student Achievement" (paper presented at the annual meeting of the American Educational Research Association, Boston, April 1990); Adam Gamoran and Mark Berends, "The Effects of Stratification in Secondary Schools: Synthesis of Survey and Ethnographic Research," *Review of Educational Research* 57, no. 4 (1987): 415–436; Adam Gamoran and Eileen C. Hannigan, "Algebra for Everyone? Benefits of College-Preparatory Mathematics for Students with Diverse Abilities in Early Secondary School," *Educational Evaluation and Policy Analysis* 22, no. 3 (2000): 241–254; Adam Gamoran and Robert Mare, "Secondary School Tracking and Educational Inequality: Compensation, Reinforcement, or Neutrality?" *American Journal of Sociology* 94, no. 5 (1989): 1146–1183; Jeannie Oakes, *Keeping Track: How Schools Structure Inequality* (New Haven, CT: Yale University Press, 1985); and Jeannie Oakes, *Multiplying Inequalities: The Effects of Race, Social Class, and Tracking on Opportunities to Learn Mathematics and Science* (Santa Monica, CA: RAND Corporation, 1990).

14. Pasi Sahlberg, "Educational Change in Finland," in *Second International Handbook of Educational Change*, ed. Andy Hargreaves, Ann Lieberman, Michael Fullan, and David Hopkins (Dordrecht, Netherlands: Springer, 2009), 323–348.

15. Organisation for Economic Co-operation and Development (OECD), *PISA 2009 Results: Overcoming Social Background; Equity in Learning Opportunities and Outcomes,* vol. 2 (Paris: OECD, 2010), table II.5.1, p. 185.

16. Henry Levin, Clive Belfield, Peter Muennig, and Cecilia Rouse, *The Costs and Benefits of an Excellent Education for All of America's Children* (New York: Teachers College, Columbia University, 2007); and Bruce Western, Vincent Schiraldi, and Jason Ziedenberg, *Education and Incarceration* (Washington, DC: Justice Policy Institute, 2003).

Teaching with a Common Curriculum

(Continued from page 29)

pate. Teachers may find themselves under pressure to raise students' scores in certain skill areas, with little or no attention to the substance of their courses (or the long-term needs of their students). The federal government's rush to create assessments aligned to the Common Core State Standards suggests deep confusion about the distinction between standards and curriculum.* It also disregards the slow work that a high-quality curriculum entails and the improvements that could be made if we devoted ourselves to this work over time.

A good curriculum has no shortage of surprises. Far from damping the intellect and spirit, it allows the mind to play. Just as a hundred musical variations can come from a single theme, so a rich variety of lessons can spring from a single topic. But curriculum is not only a boon to the imagination; it is a necessity. Without a curriculum, we risk confusion, inconsistency, loss of common knowledge, and loss of integrity. Because every school needs some kind of structure, mandates will likely fill the void—mandates about how to arrange the desks, what to put up on the walls, what to write on the board, where to walk, and what to say. That is far more constraining than a curriculum. It is not easy to arrive at a common core curriculum, but the work is urgent, elemental, and lasting. Let it begin. ❐

Endnotes

1. Lewis Carroll, *The Annotated Alice: Alice's Adventures in Wonderland & Through the Looking Glass* (New York: Norton, 1999), 162.

2. Finnish National Board of Education, *National Core Curriculum for Upper Secondary Schools 2003*, www.oph.fi/download/47678_core_curricula_upper_secondary_education.pdf.

3. Finnish National Board of Education, *National Core Curriculum*, 126–127.

4. Lizette Alvarez, "Suutarila Journal; Educators Flocking to Finland, Land of Literate Children," *New York Times*, April 9, 2004.

5. Sheila Byrd Carmichael, Gabrielle Martino, Kathleen Porter-Magee, and W. Stephen Wilson, *The State of State Standards—and the Common Core—in 2010* (Washington, DC: Thomas B. Fordham Institute, 2010).

6. Common Core State Standards Initiative, *Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects*, www.corestandards.org/the-standards/english-language-arts-standards.

7. William C. Bagley, *Education and Emergent Man: A Theory of Education with Particular Application to Public Education in the United States* (New York: Nelson, 1934), 120.

8. William Shakespeare, *A Midsummer Night's Dream* (New York: Washington Square, 1993), 1.2.29–32, 2.1.15.

9. Michael Winerip, "Courage? Follow the Yellow Brick Road," *New York Times*, June 14, 2006.

10. Diana Senechal, "Why Do We Need a Philosophy of Education? The Forgotten Insights of Michael John Demiashkevich," *American Educational History Journal* 37, no. 1 (2010), 1–18.

11. Christina Rossetti, "Who has seen the wind?," in *Sing-Song: A Nursery Rhyme Book* (London: Routledge, 1872), 93.

12. Wesley Null, *Curriculum: From Theory to Practice* (Lanham, MD: Rowman and Littlefield, 2011), manuscript page 310 (quoted with permission of author).

13. E. D. Hirsch, Jr., *Cultural Literacy: What Every American Needs to Know* (New York: Vintage, 1988), 127–130.

14. For more on this topic, see William Empson, "The Praise of Folly" and "Fool in Lear," in *The Structure of Complex Words* (Totowa, NJ: Rowman and Littlefield, 1979), 105–157.

15. Deborah Meier, *In Schools We Trust: Creating Communities of Learning in an Era of Testing and Standardization* (Boston: Beacon, 2002), 20; and Deborah Meier, " 'Data Informed,' Not 'Data Driven,' " *Bridging Differences* (blog), *Education Week*, March 5, 2009.

16. Diane Ravitch, *The Language Police: How Pressure Groups Restrict What Students Learn* (New York: Knopf, 2003), 129, 149.

*In September, just three months after the final draft of the Common Core State Standards was released, the U.S. Department of Education awarded $330 million to two consortia of states to develop assessments based on the new standards.

Teacher Preparation

(Continued from page 46)

coherent educational system, but the chief barriers are mobilizing political support for such an approach and agreeing on its educational content. The infrastructure to which I refer is not radical or unfamiliar for education throughout the world; it is only radical in the United States.

The Common Core State Standards Initiative (see **www.corestandards.org**) could help chart a way out of these difficulties. To date, it has focused on academic standards and tests, but at least some of the founding ideas saw standards as the first step in a process of building several elements of educational infrastructure, including aligned assessments, texts, and perhaps curriculum or curriculum frameworks. The standards have gotten good reviews, even from some likely skeptics, and work has begun on two systems of assessment. It remains to be seen whether the assessments will be well designed and how well they will be tied to the standards. "Alignment" has become a standard bit of education jargon since 1994, when both the Goals 2000: Educate America Act and the Improving America's Schools Act were signed into law,† but it has been little explored; I have found, for instance, no criteria with which to judge the quality and extent of alignment between tests and standards. It also remains to be seen whether a curriculum or curriculum frameworks will be devised, and if devised, how well aligned they will be with assessments and standards. Even if all these things are accomplished, it remains to be seen whether publishers will produce quality materials that are tied closely to curriculum frameworks. And if all of these steps were taken, there would remain the last and largest problem: how can we enable those who teach and intend to teach to learn to use these educational resources to good effect, and how can we build systems of teacher education to enable that learning? Constructive answers to these questions would require extensive redesign of teachers' work, to build into schoolwork many more opportunities to learn, and to ground teacher education in practice.

The political and educational barriers are not trivial, yet absent a common curriculum, common assessments, common measures of performance, and teacher education tied to these things, it will be terribly difficult to devise technically valid and educationally usable means to judge and act on teaching performance. Building a coherent educational system would be a large task, but not nearly as daunting as trying to solve our educational problems without building such a system. Without standards and measures of quality practice—grounded in linked curriculum, assessments, and teacher education—it will be impossible to build a knowledgeable occupation of teaching, and a knowledgeable occupation is the only durable solution to the problem of quality in teaching. ❐

Endnotes

1. William H. Schmidt, "Too Little Too Late: American High Schools in an International Context," in *Brookings Papers on Education Policy 2002,* ed. Diane Ravitch (Washington, DC: Brookings Institution, 2003).

2. National Council for Accreditation of Teacher Education (NCATE), *Professional Standards for the Accreditation of Teacher Preparation Institutions* (Washington, DC: NCATE, 2008), 54.

3. Association for Childhood Education International (ACEI), *Elementary Education Standards and Supporting Explanation* (Olney, MD: ACEI, 2007), 5.

†To learn more about both acts, see www.archives.nysed.gov/edpolicy/research/res_essay_clinton_outline.shtml.

100% ONLINE

Graduate Programs with a Unique Degree of Character

#1

University in the country for online degree programs.

www.guidetoonlineschools.com

Master of Education: Science, Technology, Engineering and Math (STEM) Education

California University of Pennsylvania's School of Graduate Studies and Research

In an increasingly competitive world, children need the academic, problem-solving, creative and social skills to succeed in life. Cal U's Master of Education: STEM Education Track was created for you, the busy working professional, looking to ensure that your students excel in STEM disciplines.

Experienced instructors teach courses 100% online, allowing you to easily fit your class work into your schedule. You will use technology, such as online discussion groups, e-mail, pictures and video, to see practical STEM teaching in action, in real classrooms, from experienced classroom teachers.

For more information about this or other Global Online opportunities, please call **866-595-6348** or e-mail **calugo@calu.edu.**

For more than 150 years, California University of Pennsylvania has helped educators achieve their academic and professional goals. Learn how Cal U can help you achieve yours!

California University of Pennsylvania is accredited by the Commission on Higher Education of the Middle States Association of Colleges and Schools and the National Council for Accreditation of Teacher Education. Pennsylvania Department of Education-approved programs.

CALIFORNIA UNIVERSITY OF PENNSYLVANIA

BUILDING CHARACTER. BUILDING CAREERS.

www.calu.edu/go

A proud member of the Pennsylvania State System of Higher Education.

CALU

GLOBAL ONLINE

www.dysonairblade.com

Costs $1,460.00 per year to run.

Based on 100 people visiting a restroom twice a day, a paper towel dispenser will get through 146,000 towels a year.

That's a cost of $1,460.00.

Costs $34.53 per year to run.

For the same use, the Dyson Airblade™ hand dryer costs just $34.53 to run. It works in only 12 seconds and its HEPA filter cleans the air before it reaches hands.

It's fast, hygienic and a fraction of the cost of paper towels.

dyson airblade

The fastest, most hygienic hand dryer.

Usage based on 2 towels per dry (data from Dyson internal research – Sept 2008). 1400W machine shown. Calculations include standby power. Cost based on $0.01 per paper towel (data from Dyson internal research – Jan 2010) and $0.0989 per kWh (data from US Department of Energy – published May 2010). Paper towel dispenser and Dyson Airblade™ hand dryer purchase costs are excluded from comparison. 12 second dry time based on NSF protocol P335.

AFT Subscription Services

No Gimmicks... Just the Lowest Prices!

aft A Union of Professionals — AFT+ Member Benefits

Box 258, Greenvale, NY 11548
www.buymags.com/aft

Serving AFT members for over 30 years!

1-800-774-9162

MAGAZINES MAKE GREAT GIFTS!

SAVE ON LAST MINUTE GIFT SPECIALS

Smithsonian	**$12.00**
The Economist	**$77.00**
The Economist 25 iss	**$39.90**
The New Yorker 1 yr	**$39.95**
The New Yorker 2 yrs	**$75.00**
Newsweek	**$40.00**
Newsweek 2 for 1 gift	**FREE!**

Just For You!

These and Several Hundred Others For Friends and Family too!

1-800-774-9162

www.buymags.com

Publication	Usual Price	Your Price	
Alfred Hitchcock's Mystery	55.90	**32.97**	
All You	21.24	**18.00**	
Allure	16.00	**12.00**	*
American Photo	21.00	**10.50**	
American Woodworker	24.98	**19.88**	
Analog Science Fiction/Fact	55.90	**34.97**	
Aquarium Fish	24.00	**12.99**	
Architectural Digest	42.00	**24.00**	*
Arthritis Today	30.00	**9.95**	
Asimov's Science Fiction	55.90	**34.97**	
The Atlantic	29.95	**24.95**	
Automobile	19.94	**10.00**	
Autoweek	32.00	**19.95**	
Backpacker	29.98	**19.94**	*
Baseball Digest	44.95	**23.94**	
Better Homes & Gardens 1 yr	22.00	**14.97**	
2 yrs	44.00	**22.00**	
Bird Talk	24.00	**13.00**	
Birder's World	24.95	**17.00**	
Black Enterprise	22.00	**14.95**	
Bloomberg Businessweek	59.97	**40.00**	
Bon Appetit	28.00	**20.00**	*
Budget Travel	14.95	**11.97**	
Car & Driver	22.00	**10.97**	
Cat Fancy	24.00	**13.00**	
Cineaste	22.00	**20.00**	
Coastal Living 2 yrs	36.00	**16.00**	
Columbia Journalism Review	20.00	**11.99**	

Reader's Digest
An intelligent voice at a great rate!

1 full yr at just $13.96

Conde Nast Traveler	19.97	**12.00**	
Consumer Reports	29.00	**29.00**	
CR Money Adviser	29.00	**29.00**	
CR On Health	24.00	**24.00**	
Cooking Light 1 yr	20.00	**20.00**	
2 yrs	36.00	**30.00**	
Cosmopolitan	29.97	**18.00**	*
Country Living	24.00	**12.00**	
Cruise Travel	44.95	**11.97**	
Dell Fun Puzzles & Games for Kids	23.94	**17.97**	
Dell Horoscope	52.87	**32.97**	
Discover	29.95	**24.95**	
Disney's Princess (age 4+)	39.92	**34.97**	
Dog Fancy	24.00	**13.00**	
Dog World	27.97	**15.00**	
Dwell	26.95	**19.95**	

* These rates for AFT members and college students only.

Ebony 1 yr	20.00	**12.95**	
2 yrs	43.64	**20.00**	
The Economist	127.00	**77.00**	*
The Economist 25 iss		**39.90**	
Elle	28.00	**14.00**	
Elle Decor	29.00	**14.50**	
Ellery Queen's Mystery	55.90	**32.97**	
Entertainment Weekly	39.95	**34.95**	*
ESPN	26.00	**13.00**	
Esquire 1 yr	15.94	**8.00**	
2 yrs	31.88	**15.94**	
Essence	22.00	**18.96**	
Every Day with Rachael Ray	34.00	**24.00**	
EveryDay Food	18.00	**15.00**	
Family Circle	19.98	**15.00**	
Family Fun	16.95	**9.97**	
Family Handyman	24.00	**15.00**	
Field & Stream	19.97	**10.00**	
Fitness	19.98	**12.00**	
Food Network	30.00	**20.00**	
Food & Wine	39.00	**19.00**	
Forbes	59.95	**24.95**	
Foreign Affairs	44.00	**32.00**	
Foreign Policy	24.95	**17.95**	
Fortune	59.95	**29.98**	*
Girl's Life (ages 10-15)	19.95	**14.95**	
Glamour	18.00	**12.00**	*

Today's headlines. For our members!

1 yr, 56 issues for $29.95

Golf	19.95	**15.00**	
Golf Digest	27.94	**14.97**	
Golf World	53.97	**29.97**	
Good Housekeeping	23.97	**12.00**	
GQ	20.00	**15.00**	*
Harper's Bazaar	18.00	**15.00**	
Harper's Magazine	21.00	**11.97**	
Highlights For Children	34.95	**34.95**	
Hispanic Magazine	24.00	**15.00**	
Horse Illustrated	23.97	**10.00**	
House Beautiful	19.97	**15.00**	
Humpty Dumpty (ages 5-7)	22.95	**17.29**	
Instructor (K-8)	19.95	**8.00**	
InStyle	22.15	**18.00**	*
Jet	38.00	**26.00**	
Kiplinger's Personal Finance	23.95	**12.00**	
Kiplinger's Retirement Report	59.95	**39.95**	
Ladies Home Journal	16.97	**9.99**	
Latina	17.97	**9.97**	
Lucky	20.00	**12.00**	
Mad Magazine	36.00	**14.99**	

www.buymags.com/aft

Marie Claire	19.97	**12.00**	
Martha Stewart Living	28.00	**24.00**	
Men's Journal	19.97	**9.97**	
Money [12 issues]	39.89	**19.95**	*
More Magazine	18.00	**14.97**	
Mother Earth News	18.00	**13.97**	
Mother Jones	24.00	**15.00**	
Motor Trend	18.00	**10.00**	
Motorboating	23.96	**14.00**	
The Nation	52.00	**26.00**	
National Geographic Traveler	17.95	**14.95**	
New York	24.97	**19.97**	
The New Yorker 1 yr	69.95	**39.95**	
2 yrs	102.07	**75.00**	
Newsweek	50.00	**40.00**	
Newsweek 2 for 1 gift		**FREE!**	
Old House Journal	27.00	**13.97**	
Organic Gardening	24.96	**23.94**	*
Outdoor Life	19.97	**11.97**	
Outdoor Photographer	19.94	**10.98**	
Parenting - Early Years	17.97	**9.97**	
Parenting - School Years	17.97	**9.97**	
Parents	15.98	**9.97**	
PC World	29.90	**19.97**	
Popular Photography	24.00	**11.97**	

- *Best Titles*
- *LOWEST Rates*
- *GREAT GIFTS!*

Extended Office Hours Mon.-Thur. 9am-6pm & Fri. til 5pm ET

Popular Science	19.95	**12.00**	
Preschool Friends (2-6)	39.92	**34.97**	
Prevention	21.97	**16.94**	*
Psychology Today 1 yr	21.00	**15.97**	
2 yrs	42.00	**20.97**	
Reader's Digest	24.98	**13.96**	
large print edition	29.96	**21.95**	
Real Simple	28.95	**24.00**	*
Redbook	17.97	**12.00**	
Road & Track	22.00	**10.97**	
Rolling Stone	25.94	**14.95**	
Runner's World	24.00	**20.00**	*
Sail	29.95	**10.00**	
Saveur	29.95	**19.95**	
Scholastic Parent & Child	15.00	**15.00**	
Science Illustrated	24.95	**20.00**	
Scientific American	34.97	**24.97**	
Scientific American Mind	19.95	**19.95**	
Self	17.97	**14.97**	*

1-800-774-9162

Seventeen	19.95	**12.00**	
Shape	21.97	**14.97**	
Slam [NBA]	19.97	**12.97**	
Smart Money	24.00	**15.00**	
Smithsonian	34.00	**12.00**	
Sound & Vision	29.00	**12.00**	
Southern Living	36.00	**24.00**	
Sparkle World (girls 3+)	39.92	**34.97**	
Sporting News	59.90	**20.00**	
Sports Illustrated	89.04	**39.95**	*
Stereophile	19.94	**12.97**	

Great gift for the do-it-yourselfer!

1 yr, for only $15.00

Sunset	24.00	**19.95**	
Teen Trend	16.00	**12.95**	
Teen Vogue	15.00	**10.00**	
Tennis	18.00	**12.00**	
This Old House 1 yr	20.00	**20.00**	
2 yrs	40.00	**30.00**	
Time [56 issues]	59.95	**29.95**	*
Time Out - New York	39.94	**19.97**	
Town & Country	28.00	**15.00**	
Travel & Leisure	45.00	**19.00**	
TV Guide	58.14	**39.96**	
Us Weekly	79.96	**59.97**	
Vegetarian Times	19.95	**11.95**	
Vogue	29.95	**17.97**	
W Magazine	29.90	**14.95**	
The Week	59.00	**50.00**	
The Weekly Standard	79.96	**47.96**	
Weight Watchers	17.70	**14.95**	
Whole Living	24.00	**14.95**	
Wine Enthusiast	35.00	**26.95**	
Wired	24.00	**12.00**	
Woman's Day	18.00	**9.99**	
Women's Health	17.97	**14.97**	*
Working Mother	12.97	**9.97**	
Yoga Journal 1 yr	21.95	**15.95**	
2 yrs	43.90	**26.95**	

Hundreds of Others Just Ask!

For renewals include a mailing label, if available. All subscriptions one year unless otherwise indicated.

AFT SUBSCRIPTION SERVICES
Box 258 • Greenvale, NY 11548

Name_____

Address_____

City, State, Zip_____

E-mail _____

Your School_____

Home Phone (_____)_____

FREE gift card upon request - CALL or send a separate note.

Publication Name	Years	Price
	Total	

❑ Please bill me
❑ Check enclosed payable to: **AFTSS**
❑ Charge to my credit card
❑ Visa ❑ MasterCard ❑ Discover ❑ Amex

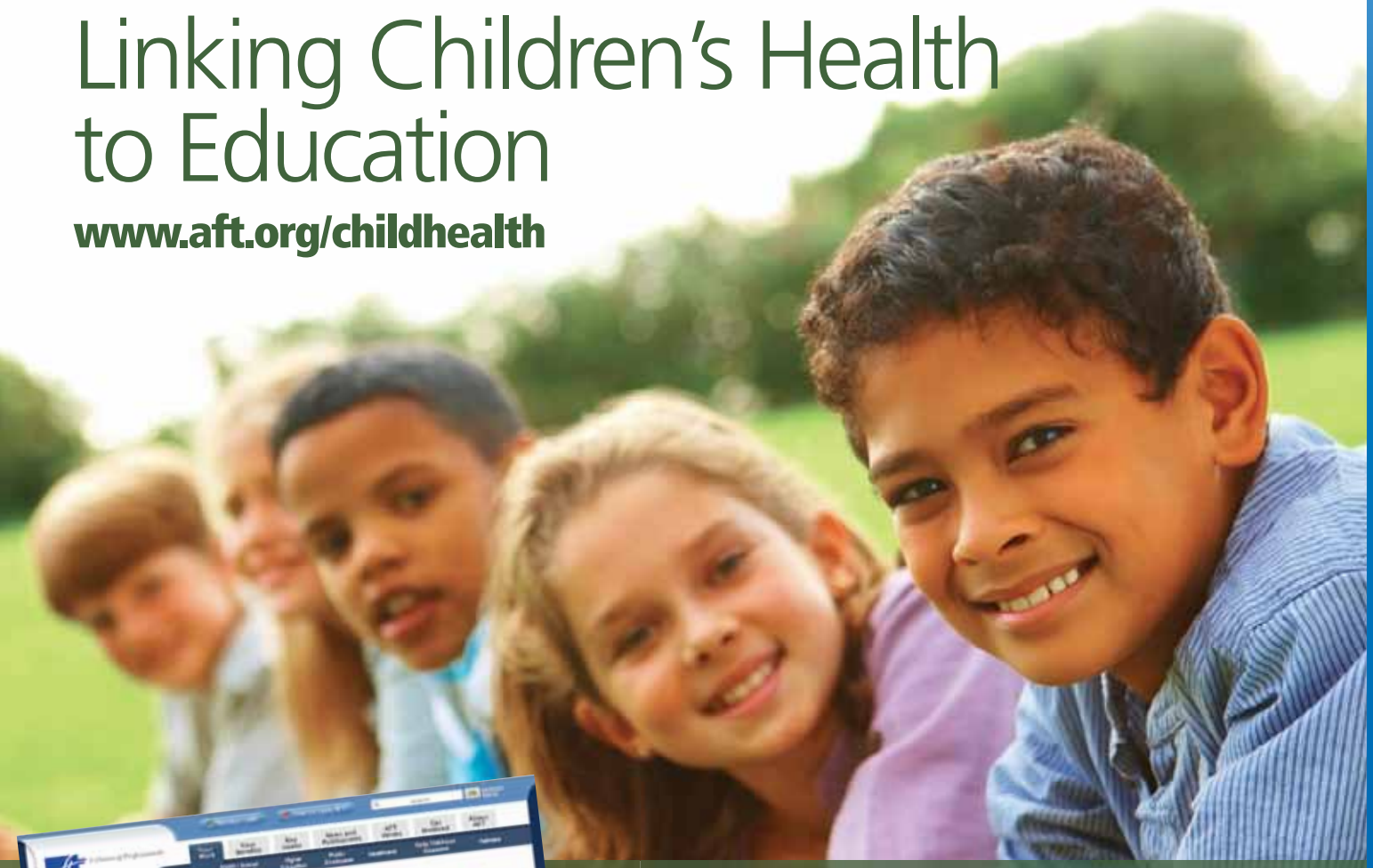
Acct: _____ Exp. Date: ____

S3012

American Educator VOL. 34, NO. 4 | WINTER 2010–2011

Linking Children's Health to Education

www.aft.org/childhealth



If students aren't healthy, they aren't ready to learn. A toothache, untreated asthma, an inability to see the board, and other health problems make it hard for students to pay attention in class. Teachers and parents know that children's health affects their learning, but they may not always know where to turn for help.

The AFT has created a website, **www.aft.org/childhealth**, that lists useful resources for the prevention and treatment of various illnesses in several areas, including dental and mental health, vision, hunger and nutrition, obesity, eating disorders, and chronic illnesses such as diabetes and seizures. Resources include links to the websites of the Centers for Disease Control, the American Dental Association, and the Food Research Action Center, among others. With such information readily available, poor health should not have to limit students' potential.