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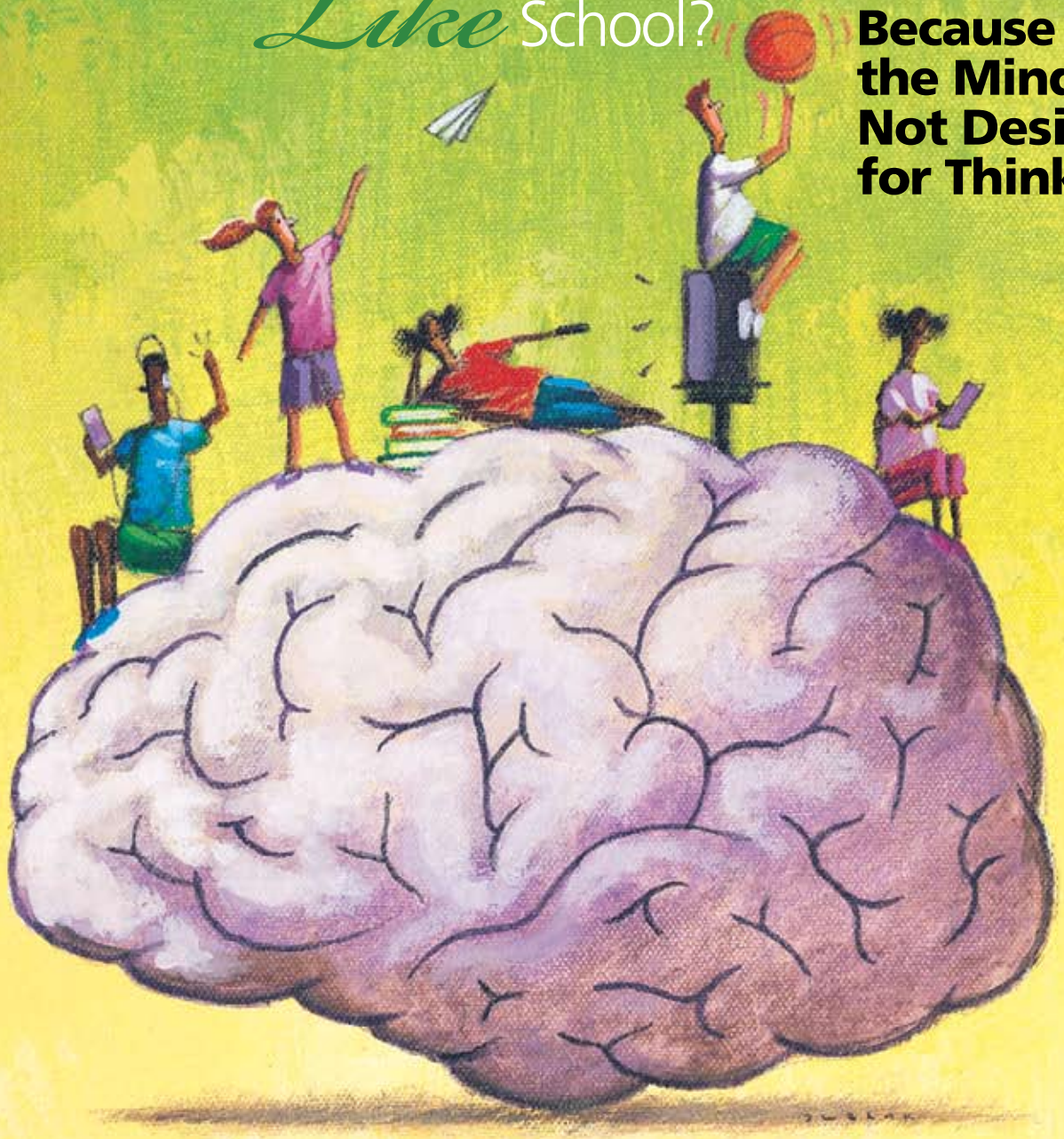
Why Don't Students *Like* School?

Because the Mind Is Not Designed for Thinking



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Spelling Resonates with Readers

I'm an elementary school teacher in an urban school district. I've been teaching for 20 years, the first 11 using whole language methods. It was when I switched to teaching phonetically and began helping students learn to spell using some of the methods and information stated in your article ("How Words Cast Their Spell," Winter 2008–09) that I really began seeing students learn to spell, read, and write effectively.

I was thrilled reading this article because for years, the ideas and methods presented in the article seem to have been forced underground. It was only after I got frustrated enough to search out information on phonics that I was able also to find a method for explicitly teaching both phonetics and spelling. As I said previously, it has made a huge difference in student achievement, especially for students who couldn't be reached using the currently approved methods.

I knew when phonics went out of vogue that it would be the death of being able to spell. The lack of writing skills and the ability to put together a well-formed sentence went out the door when we stopped teaching how to diagram a sentence. Let's get back to basics!

–DARLA URBINA
Gateway Institute of Technology
St. Louis, Mo.

I was interested to read the research in your article on spelling. As the director of the Professional Writing Program at Champlain College, I've been adopting an approach with first-year writing majors that seems to combine many of your recommendations and adds a couple of strategies of my own.

In the first course my students take in the program, I give them the 100 most frequently misspelled words in American English, and tell them that at the end of the semester I'll give them a spelling exam on those words, and if they fail the exam they fail the course. Early in the semester, perhaps in the second week, I quiz them on 20 of the words, taken at random. Scores range from about 18 down to, I'm sorry to say, 6–8.

This instills a certain sense of urgency, but that's only part of the plan. As we're going over the words in class, I teach them about Latin prefixes, suffixes, and roots. They recognize most suffixes and roots and can guess at their meanings, and I encourage them to look for similar English words so they can guess at the common root. Almost at once they can start making smarter guesses about, for example, doubled consonants.

We repeat that class format three or four times in the semester, touching on Greek, German, and French ancestry of English words. If I have time, I give a high-speed, light-hearted history of the English language in 75 minutes, starting with the history of punctuation and moving through Anglo-Saxon and Middle English roughly to Shakespeare's English. Once they've guessed at the meanings of Roman place-names and sentences from the *Anglo-Saxon Chronicle*, modern American English seems a lot less daunting.

Useful and entertaining though all this is, in some respects it's only part of a larger and, I think, more important enterprise: getting them to pay sharper and more astute attention to language. The importance of attention, of focusing on the syntax, meaning, spelling, punctuation, and even sounds of sentences and individual words, is central to the work we do all semester: virtually every class we project several short pieces of students' writing on the wall and look at them very closely. Part of this is because this is what a writer does, of course; but part is because I've found over and again that the mistakes college students make, in both spelling and grammar/punctuation, arise not from ignorance but from inattention: once they look more carefully at what they've written, they usually see the mistake.

Spelling, as the authors say, is part of learning the language; and learning the language can be a great deal more fun than most students (or some teachers) suspect. This past semester, as we were discussing the strange etymology (and spelling) of the word "weird," a student asked, "Does it have anything to do with the fact that 'Wyrd' in Anglo-Saxon means 'fate'?" Not only that, but by the end of the semester, that classroom is one of the few places in the English-speaking world where everyone in sight can spell "definitely."

–TIM BROOKES
Champlain College
Burlington, Vt.

Dispelling Myths about Teacher "Tenure"

Education Historian Diane Ravitch on Teachers' Unions

Since February 2007, two leading figures in education, Deborah Meier and Diane Ravitch, have been debating public education—its strengths, weaknesses, improvement strategies, and more—in a blog called Bridging Differences. (A complete archive is available online at **http://blogs.edweek.org/edweek/Bridging-Differences**.*) The following is excerpted with permission from Diane Ravitch's post on February 3, 2009.*

RECENTLY, AN OLD FRIEND who is a businessman and philanthropist sent me a copy of a speech that he gave at Channel 13's Celebration of Teaching and Learning. For many years, he and his family have very generously supported a school for gifted children in one of New York City's poorest neighborhoods. The main conclusion of his speech was that the obstacle to educating all children well is the union, because the principal cannot hire and fire and assign teachers as he or she wants. He asked me what I thought of his ideas.

I responded that I was puzzled. The unions don't seem to cause low performance in the wealthy suburban districts that surround our city. They don't seem to be a problem for the nations that regularly register high scores on international tests. If getting rid of the unions were the solution to the problem of low performance, then why, I asked him, do the southern states—where unions are weak or nonexistent—continue to perform worse than states with strong unions? And how can we explain the strong union presence in Massachusetts, which is the nation's highest performing state on the National Assessment of Educational Progress? I suggested that low performance must be caused by something else other than teachers' unions. I have not yet received a reply, so I suppose he is thinking about it.

It actually doesn't seem to be all that hard to get rid of incompetent teachers. It appears that 40 percent of all those who enter teaching are gone within five years, according to research that I have seen. In every district, to my knowledge, teachers do not gain due process rights for three years (in some places, it takes five). During those three to five years, their supervisors have plenty of time and opportunity to evaluate them and tell them to leave teaching.

Then, when they have passed the three- or five-year mark, they have due process rights. They cannot be terminated without cause and due process. Although that is usually referred to as tenure, it really is not tenure. In higher education, tenure is an iron-clad guarantee of lifetime employment except for very egregious causes. Teachers do not have that. They have the right to due process. Many administrators would like to fire teachers without due process. I can't blame teachers for wanting protection from arbitrary administrators, especially now, when there are quite a few high-profile superintendents who like to grab headlines by threatening to fire teachers.

The right to form and join a union is one of the rights enumerated in the *Universal Declaration of Human Rights* (Article 23). I made several trips to Eastern Europe and the Soviet Union before the end of the Cold War and met many teachers who were eager to belong to a union that would protect their interests. The state did not want unions or tolerated only faux-unions.

I read recently that membership in unions is now under 10 percent of the private-sector workforce. Former Secretary of Labor Robert Reich wrote in the *Los Angeles Times* not long ago that the unions helped our nation build a solid middle class. Now, in these difficult times, we may again see a turn to unionism, and for all the predictable reasons, having to do with protection from arbitrary and capricious management to economic security to the demand to have a voice in decisions about the workplace.

Replace Your Well-Worn Copies

For years I have used the article by Rick Ayers that appeared in the Winter 2004–05 issue of *American Educator*, "Agamemnon for At-Risk Teens," as part of a discussion in my Golden Age of Athens course. Finally it happened: I have lost my tattered copy. I tried to download it from your online journal, only to find that it was not available. Is there any way I can obtain another copy? Just as the *Oresteia* was a bridge between ancient literature and those inner city kids, so Mr. Ayers' article helped me bridge the gap between ancient Athens and modern life such as my students know it.

–NIKI KANTZIOS
University of South Florida
Tampa, Fla.

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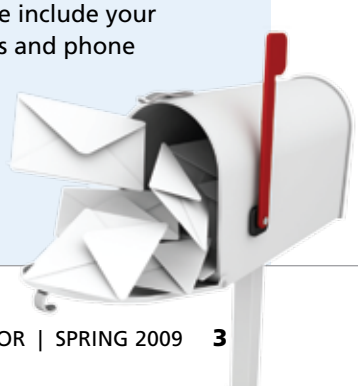
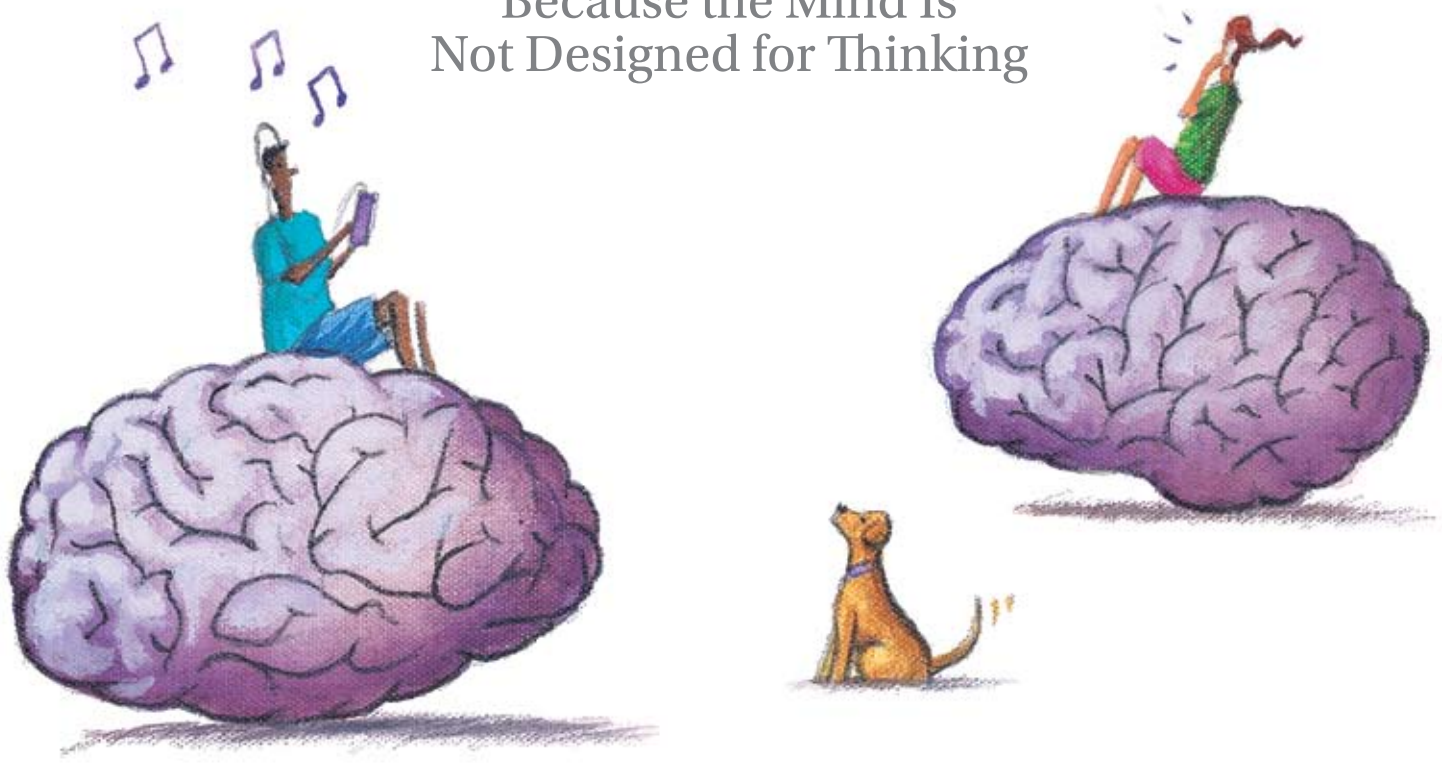


Why Don't Students *Like* School?

Because the Mind Is Not Designed for Thinking



By Daniel T. Willingham

Question: Most of the teachers I know entered the profession because they loved school as children. They want to help their students feel the same excitement and passion for learning that they did. They are understandably dejected when they find that some of their pupils don't like school much, and that they, the teachers, have great difficulty inspiring them. Why is it difficult to make school enjoyable for students?

Answer: Contrary to popular belief, the brain is not designed for thinking. It's designed to save you from having to think, because the brain is actually not very good at thinking. Thinking is slow and unreliable. Nevertheless, people enjoy mental work if it is successful. People like to solve problems, but not to work on unsolvable problems. If schoolwork is always just a bit too difficult for a student, it should be no surprise that she doesn't like school much. The cognitive principle that guides this article is: *People are naturally curious, but they are not naturally good thinkers; unless the cognitive conditions are right, people will avoid thinking.* The implication of this principle is that teachers should reconsider how they encourage their students to think in order to maximize the likelihood that students will get the pleasurable rush that comes from successful thought.

What is the essence of being human? What sets us apart from other species? Many would answer that it is our ability to reason—birds fly, fish swim, and humans think. (By "thinking," I mean solving problems, reasoning, reading something complex, or doing any mental work that requires some effort.) Shakespeare extolled our cognitive ability in *Hamlet*: "What a piece of work is man! How noble in reason!" Some 300 years later, however, Henry Ford more cynically observed, "Thinking is the hardest work there is, which is the probable reason why so few people engage in it." They both had a point. Humans are good at certain types of reasoning, particularly in comparison with other animals. But we

Daniel T. Willingham is professor of cognitive psychology at the University of Virginia and author of numerous articles, including his regular "Ask the Cognitive Scientist" articles for American Educator. *To read more of his work on education, go to* ***www.danielwillingham.com****.*

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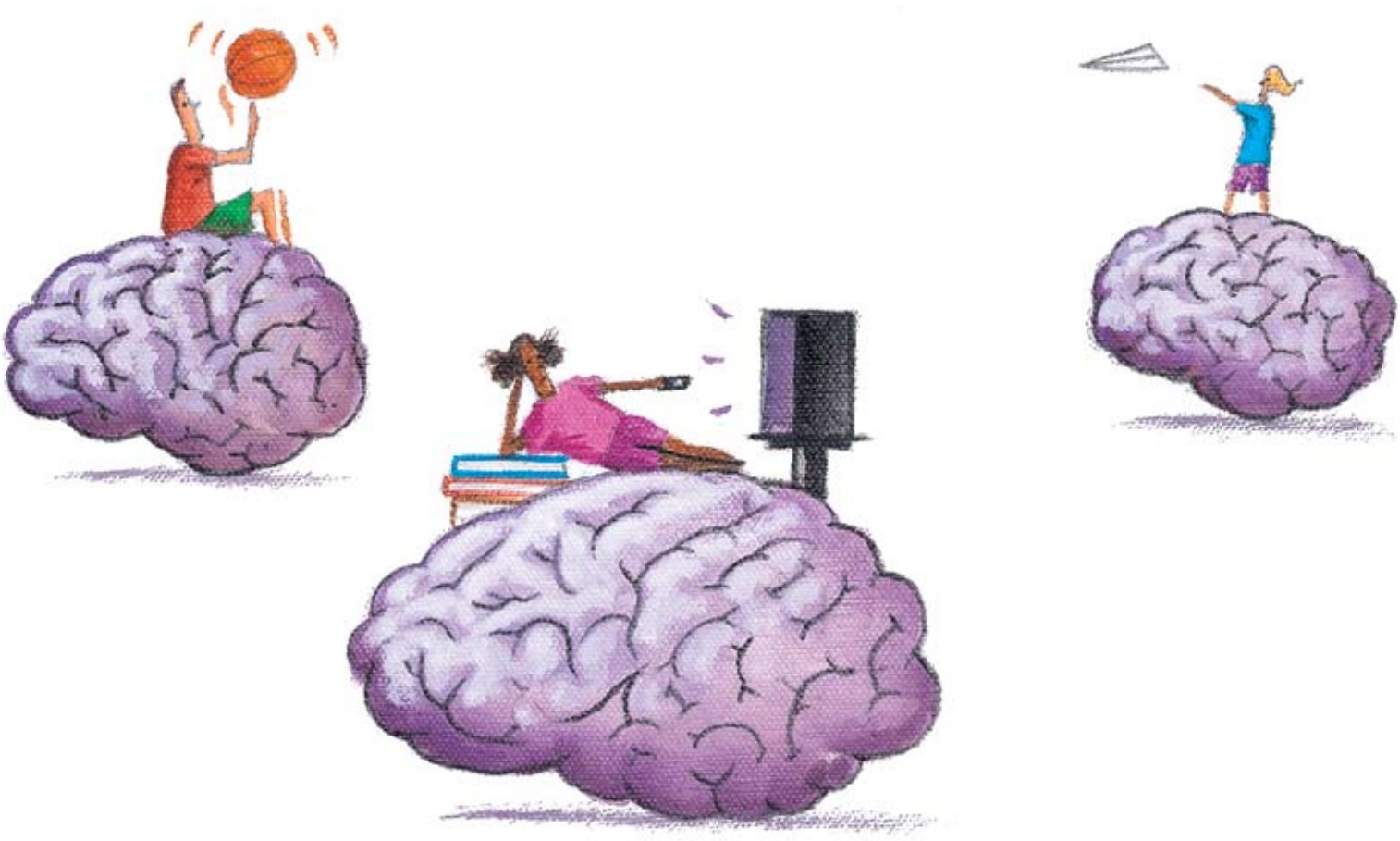


exercise that ability infrequently. A cognitive scientist would add another observation. Humans don't think very often because our brains are designed not for thought, but for the avoidance of thought. Thinking is not only effortful, as Ford noted, it's also slow and unreliable.

Your brain serves many purposes, and thinking is not the one it does best. Your brain also supports the ability to see and to move, for example, and these functions operate much more efficiently and reliably than our ability to think. It's no accident that most of your brain's real estate is devoted to them. The extra brain power is needed because seeing is actually more difficult than playing chess or solving calculus problems.

Compared with your ability to see and move, thinking is slow, effortful, and uncertain. To get a feel for why I say that, try this problem:

> In an empty room are a candle, some matches, and a box of tacks. The goal is to have the lit candle about five feet off the ground. You've tried melting some of the wax on the bottom of the candle and sticking it to the wall, but that wasn't effective. How can you get the lit candle to be five feet off the ground without your having to hold it there?*

Twenty minutes is the usual maximum time allowed and few people are able to solve it by then, although once you hear the answer you realize that it's not especially tricky. You dump the tacks out of the box, tack the box to the wall, and use it as a platform for the candle.

This problem illustrates three properties of thinking. First, thinking is *slow*. Your visual system instantly takes in a complex scene. When you enter a friend's backyard, you don't think to yourself, "Hmm ... there's some green stuff. Probably grass, but it could be some other ground cover ... and what's that rough brown object sticking up there? A fence, perhaps?" You take in the whole scene—lawn, fence, flower beds, gazebo—at a glance. Your thinking system does not instantly calculate the answer to a problem the way that your visual system immediately takes in a visual scene.

Second, thinking is *effortful*; you don't have to try to see, but thinking takes concentration. You can perform other tasks while you see, but you can't think about something else while you work on a problem.

*Karl Duncker, "On Problem-Solving," *Psychological Monographs* 58, no. 5 (1945): 113.

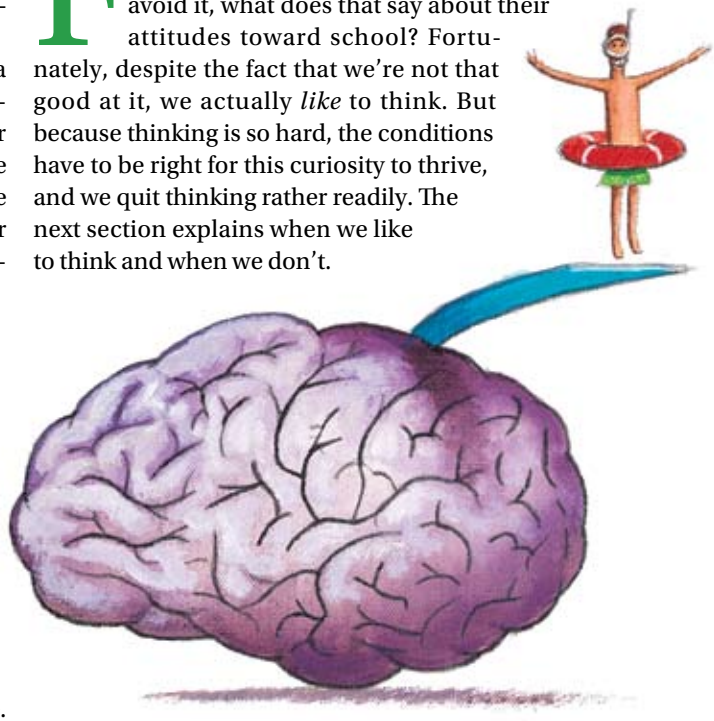
Third, thinking is *uncertain*. Your visual system seldom makes mistakes, and when it does, you usually think you see something similar to what is actually out there—you're close, if not exactly right. Your thinking system might not even get you close; your solution to a problem may be far from correct. In fact, your thinking system may not produce an answer at all, which is what happens to most people when they try the candle problem.

If we're all so bad at thinking, how does anyone hold down a job, or manage his money? How does a teacher make the hundreds of decisions necessary to get through her day? The answer is that, when we can get away with it, we don't think. Instead, we rely on memory. Most of the problems you face are ones you've solved before, so you just do what you've done in the past. For example, suppose next week a friend gives you the candle problem. You would immediately say, "Oh, right. I've heard this one. You tack the box to the wall." Just as your visual system takes in a scene and, without any effort on your part, tells you what is in the environment, so too your memory system immediately and effortlessly recognizes that you've heard the problem before and provides the answer. Most people think that they have a terrible memory, and it's true that your memory is not as reliable as your visual or movement systems—but your memory system is much more reliable than your thinking system, and provides answers quickly and with little effort.

When we can get away with it, we don't think. Instead, we rely on memory. Most of the problems you face are ones you've solved before, so you just do what you've done in the past.

We normally think of memory as storing personal events (e.g., memories of my wedding) and facts (e.g., George Washington was the first president of the United States). Your memory also stores procedures to guide what you should do: where to turn when you're driving home, how to handle a minor dispute when you're monitoring recess, what to do when a pot on the stove starts to boil over. For the vast majority of decisions you make, you don't stop to consider what you might do, reason about it, anticipate possible consequences, and so on. You do take such steps when faced with a new problem, but not when faced with a problem you've already encountered many times. That's because one more way that your brain saves you from having to think is by changing. If you repeat the same thought-demanding task again and again, it will eventually become automatic; your brain will change so that you can complete the task without thinking about it. When you feel as though you are "on autopilot," even if you're doing something rather complex, such as driving home from your school, it's because you are using memory to guide your behavior. Using memory doesn't require much of your attention, so you are free to daydream, even as you're stopping at red lights, passing cars, watching for pedestrians, and so on.

For education, the implications of this section sound rather grim. If people are bad at thinking and try to avoid it, what does that say about their attitudes toward school? Fortunately, despite the fact that we're not that good at it, we actually *like* to think. But because thinking is so hard, the conditions have to be right for this curiosity to thrive, and we quit thinking rather readily. The next section explains when we like to think and when we don't.



People Are Naturally Curious, But Curiosity Is Fragile

Even though our brains are not set up for very efficient thinking, people actually enjoy mental activity, at least in some circumstances. They have hobbies like solving crossword puzzles or scrutinizing maps. They watch information-packed documentaries. They pursue careers—such as teaching—that offer greater mental challenge than competing careers, even if the pay is lower. Not only are they willing to think, they intentionally seek out situations that demand thought.

Solving problems brings pleasure. When I say "problem solving" here, I mean any cognitive work that succeeds; it might be understanding a difficult passage of prose, planning a garden, or sizing up an investment opportunity. There is a sense of satisfaction, of fulfillment, in successful thinking. In the last 10 years, neuroscientists have discovered that there is overlap in the brain areas and chemicals that are important in learning and those that are important in the brain's natural reward system. Many neuroscientists suspect that the two systems are related, even though they haven't worked out the explicit tie between them yet.

It's notable too that the pleasure is in the *solving* of the problem. Working on a problem with no sense that you're making progress is not pleasurable. In fact, it's frustrating. And there's not great pleasure in simply knowing the answer either. I told you the solution to the candle problem; did you get any fun out of it? Think how much more fun it would have been if you had solved it yourself—in fact, the problem would have seemed more

clever, just as a joke that you get is funnier than a joke that has to be explained. Even if someone doesn't tell you the answer to a problem, once you've had too many hints you lose the sense that *you've* solved the problem and getting the answer doesn't bring the same mental snap of satisfaction.

Mental work appeals to us because it offers the opportunity for that pleasant feeling when it succeeds. But not all types of thinking are equally attractive. People choose to work crossword puzzles, but not algebra problems. A biography of the vocalist Bono is more likely to sell well than a biography of the poet Keats. What characterizes the mental activity that people enjoy?

The answer most people would give may seem obvious. "I think crossword puzzles are fun and Bono is cool, but math is boring and so is Keats." In other words, it's the content that matters. But I don't think that content drives interest. We've all attended a lecture or watched a TV show (perhaps against our will) about a subject we thought we weren't interested in, only to find ourselves fascinated. And it's easy to get bored even when you usually like the topic. I'll never forget my anticipation for the day my middle school teacher was to talk about sex. As a teenage boy in a staid 1970s suburban culture, I fizzed with anticipation of any talk about sex, anytime, anywhere. But when the big day came, my friends and I were absolutely disabled with boredom. It's not that the teacher talked about flowers and pollination, he really did talk about human sexuality, but somehow it was still dull. I actually wish I could remember how he did it; boring a bunch of hormonal teenagers with a sex talk is quite a feat.

So if content is not enough to keep your attention, when does curiosity have staying power? The answer may lie in the difficulty of the problem. If we get a little burst of pleasure from solving a problem, then there's no point in working on a problem that is too easy—there'll be no pleasure when it's solved because it didn't feel like much of a problem in the first place. Then too, when you size up a problem as very difficult, you are judging that you're unlikely to solve it, and therefore unlikely to get the satisfaction that would come with the solution. So there is no inconsistency in claiming that people avoid thought and in claiming that people are naturally curious—curiosity prompts people to explore new ideas and problems, but when they do, they quickly evaluate how much mental work it will take to solve the problem. If it's too much or too little, people stop working on the problem if they can.

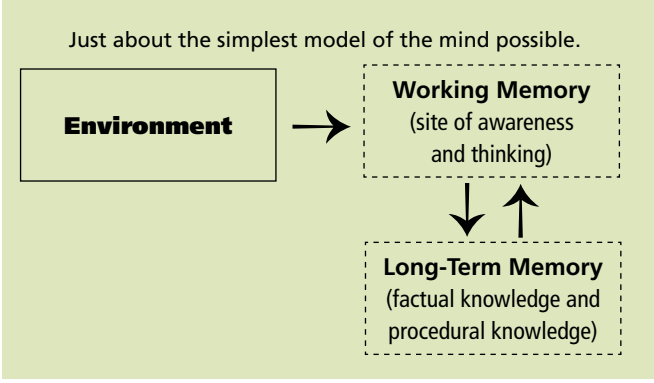
> Working on problems that are at the right level of difficulty is rewarding, but working on problems that are too easy or too difficult is unpleasant.

Our analysis of the sorts of mental work that people seek out or avoid provides one answer to why more students don't like school. Working on problems that are at the right level of difficulty is rewarding, but working on problems that are too easy or too difficult is unpleasant. Students can't opt out of these problems the way that adults often can. If the student routinely gets work that is a bit too difficult, it's little wonder that he doesn't care much for school.

So what's the solution? Give the student easier work? You could, but of course you'd have to be careful not to make it so easy that the student would be bored. And anyway, wouldn't it be better to boost the student's ability a little bit? Instead of making the work easier, is it possible to make thinking easier?

How Thinking Works

Understanding a bit about how thinking happens will help you understand what makes thinking hard. That, in turn, will help you understand how to make thinking easier for your students, and therefore help them enjoy school more.



Let's begin with a very simple model of the mind. The figure above shows the environment on the left, full of things to see and hear, problems to be solved, and so on. On the right is one component of your mind that scientists call *working memory*; it holds the stuff that you're thinking about and is the part of your mind where you are aware of what is around you: the sight of a shaft of light falling on a dusty table, the sound of a dog barking in the distance, and so forth. Of course, you can also be aware of things that are not currently in the environment; for example, you can recall the sound of your mother's voice, even if she's not in the room (or indeed, no longer living). *Long-term memory* is the vast storehouse in which you maintain your factual knowledge of the world: that ladybugs have spots, that triangles are closed figures with three sides, that your 3-year-old surprised you yesterday by mentioning kumquats, and so on. All of the information in long-term memory resides outside of awareness. It lies quietly until it is needed, and then enters working memory, and so becomes conscious.

Thinking occurs when you combine information (from the environment and from long-term memory) in new ways. That combination happens in working memory. To get a feel for this process, think back to what you did as you tried to solve the candle problem. You began by taking information from the environment—the scenario described in the problem—and then you imagined ways to solve it.

Knowing *how* to combine and rearrange ideas in working memory is essential to successful thinking. If you hadn't seen the candle problem before, you probably felt like you were pretty much guessing. You didn't have any information in long-term memory to guide you. But if you have had experience with a particular type of problem, then you likely have information in long-term memory about how to solve it, even if the information is not foolproof. For example, try to work this math problem in your head:

18
x 7

You know just what to do for this problem. Your long-term memory not only contains factual information, such as the value of 8 x 7, it also contains what we'll call *procedural knowledge*, which is your knowledge of the mental procedures necessary to execute tasks. If "thinking" is combining information in working memory, then procedural knowledge is a list of what to combine and when—it's like a recipe to get a particular type of thought accomplished. You might have stored procedures for the steps needed to calculate the area of a triangle, or to duplicate a computer file using Windows, or to drive from your home to work.

It's pretty obvious that having the appropriate procedure stored in long-term memory helps a great deal when we're thinking. That's why it was easy to solve the math problem and hard to solve the candle problem. But how about factual knowledge? Does that help you think as well? It does, in several different ways, some which are described in the sidebar below. For now,

Successful thinking relies on information from the environment, facts and procedures in long-term memory, and space in working memory.

How Can Learning Facts Make Thinking More Enjoyable—and More Effective?

In the main article, I defined "thinking" as combining information in new ways. The information can come from long-term memory—facts you've memorized—or from the environment. In today's world, is there a reason to memorize anything? You can find any factual information you need in seconds via the Internet. Then too, things change so quickly that half of the information you commit to memory will be out of date in five years—or so the argument goes. Perhaps instead of learning facts, it's better to practice critical thinking. Have students work at *evaluating* all that information available on the Internet, rather than trying to commit some small part of it to memory.

Appealing though it may be, it turns out that this argument is false. Data from the last 30 years lead to a conclusion that is not scientifically challengeable: thinking well requires knowing facts, and that's true not simply because you need something to think *about*. The very processes that teachers care about most—critical thinking processes like reasoning and problem solving—are intimately intertwined with factual knowledge that is in long-term memory (not just in the environment).

It's hard for many people to conceive of thinking processes as intertwined with knowledge. Most people believe that thinking processes are akin to those of a calculator. A calculator has a set of procedures available (addition, multiplication, and so on) that can manipulate numbers, and those procedures can be applied to *any set of numbers*. There is a separation of data (the numbers) and the operations that manipulate the data. Thus, if you learn a new thinking operation (for example, how to critically analyze historical documents), it seems like that operation should be applicable to all historical documents.

The human mind does not work that way. When we learn to think critically about, say, the start of the Second World War, that does not mean that we can think critically about a chess game, or about the current situation in the Middle East, or even about the start of the American Revolutionary War. The critical thinking processes are tied to the background knowledge.*

Much of the time that we see people apparently engaged in logical thinking, they are actually engaged in memory retrieval. As I described in the main article, memory is the cognitive process of *first* resort. When faced with a problem, you will first search for a solution in memory, and if you find one, you will very likely use it.

In fact, people draw on memory to solve problems more often than you might expect. For example, it appears that much of the difference among the world's best chess players is not their ability to reason about the game or to plan the best move; rather, it is their memory for game positions. When tournament-level chess players select a move, they first size up the game, deciding which part of the board is the most critical, the location of weak spots in their own defense and their opponents', and so on. That process relies on the player's memory for similar board positions and it greatly narrows the possible moves that the player might

Excerpted with permission from chapter 2 of Daniel T. Willingham's new book, Why Don't Students Like School? *See page 13 for more information.*

*There is one important exception—how experts think. Building expertise actually changes the thought process, but such change takes many years of advanced study and therefore is not very relevant to the K–12 setting. To learn more about the differences between novices' and experts' thinking, see "Inflexible Knowledge: The First Step to Expertise," from the Winter 2002 issue of *American Educator*, online at **www.aft.org/pubs-reports/american_educator/winter2002/CogSci.html**.

note that solving the math problem required the retrieval of factual information, such as the fact that 8 x 7 = 56 or the fact that 18 can be broken into 10 and 8. Oftentimes, the information provided in the environment is not sufficient to solve a problem—you need to supplement it with information from long-term memory.

There's a final necessity for thinking: sufficient space in working memory. Thinking becomes increasingly difficult as working memory gets crowded. A math problem requiring lots of steps, for example, would be hard to solve in your head because the steps would occupy so much space in working memory that it would be difficult to keep them all in mind.

In sum, successful thinking relies on four factors: information from the environment, facts in long-term memory, procedures in long-term memory, and space in working memory. If any one of them is inadequate, thinking will likely fail.

What Does This Mean for the Classroom?

Let's begin with the question that opened this article: what can teachers do to make school enjoyable for students? From a cognitive perspective, an important factor is whether a student consistently experiences the pleasurable rush of solving a problem. So, what can teachers do to ensure that each student gets that pleasure?

Be Sure That There Are Problems to Be Solved

By "problem," I don't necessarily mean a question posed to the class by the teacher, or a mathematical puzzle. I mean cognitive work that presents a moderate challenge, including things like understanding a poem or thinking of novel uses for recyclable materials. This sort of cognitive work is, of course, the main stuff of teaching—we want our students to think. But without some attention, a lesson plan can become a long string of teacher explanations, with little opportunity for students to solve problems. So scan each lesson plan with an eye toward the cognitive work that students will be doing. How often does such work occur? Is it intermixed with cognitive breaks? When you have identified the challenges, consider whether they are open to negative outcomes like the students failing to understand what they are to do, or

(Continued on page 12)

make. Only then does the player engage reasoning processes to select the best among several candidate moves. Psychologists estimate that top chess players may have 50,000 board positions in long-term memory. Thus, background knowledge is decisive even in chess, which we might consider the prototypical game of reasoning.

That's not to say that all problems are solved by comparing them to cases you've seen in the past. You do, of course, sometimes reason. Even in these situations, background knowledge can help. Here's an example. Do you have a friend who can walk into someone else's kitchen and rapidly produce a nice dinner from whatever food is around, usually to the astonishment of whoever's kitchen it is? When that person looks in a cupboard, she doesn't see ingredients, she sees recipes. She draws on extensive background knowledge about food and cooking.

Here's a classroom-based example. Take two algebra students—one is still a little shaky on the distributive property, whereas the other knows it cold. When the first student is trying to solve a problem and sees $a(b + c)$, he's unsure whether that's the same as $ab + c$ or $b + ac$ or $ab + ac$. So he stops working on the problem, and substitutes small numbers into $a(b + c)$ to be sure that he's got it right. The second student recognizes $a(b + c)$, and doesn't need to stop and occupy space in working memory with this subcomponent of the problem. Clearly, the second student is more likely to successfully complete the problem.

Here is one more key point about knowledge and thinking skills. Much of what experts tell us they do in the course of thinking about their fields *requires* background knowledge, even if it's not described that way. Let's take science as an example. We could tell students that when interpreting the results of an experiment, scientists are especially interested in anomalous (that is, unexpected) outcomes. Unexpected outcomes indicate that their knowledge is incomplete, and that this experiment contains hidden seeds of new knowledge. But in order for results to be unexpected, you must have an expectation! An expectation about the outcome would be based on your knowledge of the field. Most or all of what we tell students about scientific thinking strategies is impossible to use without appropriate background knowledge.

The same holds true for history, language arts, music, and so on. Generalizations that we can offer to students about how to successfully think and reason in the field may *look* like they don't require background knowledge, but when you consider how to apply them, they actually do.

–D.T.W.

Can We Make School More Enjoyable—and Effective—for "Slow" Students Too?

Americans, like other Westerners, tend to view intelligence as a fixed attribute, like eye color. If you win the genetic lottery, you're smart, but if you lose, you're not. In China, Japan, and other Eastern countries, intelligence is more often viewed as malleable. If you fail a test or don't understand a concept, it's not that you're stupid—you just haven't worked hard enough yet. So which view is correct, the Western or the Eastern? There is some truth in both. Your genetic inheritance does impact your intelligence, but it seems to do so mostly through the environment. Recent research indicates that children do differ in intelligence, but *intelligence can be changed through sustained hard work*.

Until about 20 years ago, most researchers seemed to have the sense that the range of intelligence was mostly set by genetics, and that a good or poor environment moved one's intelligence up or down a bit within that range. A real turning point in this work came during the 1980s with the discovery that IQ scores over the last half century have shown quite substantial gains. For example, in Holland, scores went up 21 points in just 30 years (1952–1982), based on scores from Dutch military draftees. This is not an isolated case. The effect has been observed in over a dozen countries throughout the world, including the United States.* Not all countries have data available to be tested—you need very large numbers of people to be sure that you're not looking at a quirky subset—but where the data are available, the effect has been found. These increases in IQ scores are much too large to have been caused by changes in genes. Some of the increase may have come from better nutrition and health care. Some of it may have come from the fact that our environment has gotten more complex, and people are more often called on to think abstractly, and to solve unfamiliar problems—the exact sorts of things you're often asked to do on IQ tests. Whatever the cause, it must be environmental.

But how does that fit with previous research, which indicated that intelligence is mostly determined by genetics? No one is completely sure. But researchers James Flynn and Bill Dickens have a pretty good suggestion. They claim that the effect of genetics is actually fairly modest. It *looks* large because the effect of genetics is to make a person likely to *seek out* particular environments. Dickens offers the following analogy. Suppose identical twins are separated at birth, and adopted into different families. Their genes make them unusually tall at a young age, and they continue to grow. Because each is tall, he tends to do well in informal basketball games around the neighborhood. For that reason, each asks his parents to put a net up at home. The skills of each twin improve with practice, and each is recruited for his junior high school basketball team. More practice leads to still better skill; by the end of high school, each twin plays quite well—not a future professional, perhaps, but better than 98 percent of the population, let's say.

Now notice what has happened. These were identical twins, raised apart. So if a researcher tracked down each twin and administered some test of basketball skill, she would find that both were quite good, and because they were raised apart, the researcher would conclude that this was a genetic effect, that skill in basketball is largely determined by one's genes. But the researcher would be mistaken. What's actually happened was that their genes made them tall, and being tall nudged them toward environments that included a lot of basketball practice. Practice—an environmental effect—made them good at basketball, not their genes.

Now think of how that might apply to intelligence. Maybe genetics has some small effect on your intelligence—it makes you a little quicker to understand things, or your memory a little bit better, or it makes you more persistent on cognitive tasks, or it simply makes you more curious. Your parents notice this, and encourage your interest. They may not even be aware that they are encouraging you. They might talk to you about more sophisticated subjects than they otherwise would and use a broader vocabulary. As you get older, you see yourself, more and more, as one of the "smart kids." You make friends with other smart kids, and enter in friendly, but quite real, competition for the highest grades. Then too, maybe genetics subtly pushes you away from other endeavors. You may be quicker cognitively, but a little clumsier physically. That makes you avoid situations that might develop your athletic skills (like pickup basketball games), and instead stay inside and read.

The key idea here is that genetics and the environment interact. Small differences in genetic inheritance can steer people to seek different experiences in their environments, and it is these environmental differences, especially over the long term, that have large cognitive consequences.

What does all this mean for education? If intelligence were all a matter of one's genetic inheritance, then there wouldn't be much point in trying to make kids smarter. Instead, you'd try to get students to do the best they could, given the genetically determined intelligence they had. But that's not the way things are. *Intelligence is malleable. It can be improved.*

So, what can you do for slow learners? Recognize that they probably differ little from your other students in terms of their potential.† But they probably differ a good bit from your other students in what they know, their motivation, their persistence in the face of academic setbacks, and in their self-image as students. I fully believe that these students can catch up, but it must be acknowledged that they are far behind, and that catching up will take enormous effort. To help slow learners catch up, you must first be sure that they believe that they can improve, and next you must try to persuade them that it will be worth it.

1. Praise Effort, Not Ability

Students should think of their intelligence as under their control, and should know that they can develop their intelligence through hard work. Therefore, you should

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Excerpted with permission from chapter 8 of Daniel T. Willingham's new book, Why Don't Students Like School? *See page 13 for more information.*

*James R. Flynn, "Massive IQ Gains in 14 Nations: What IQ Tests Really Measure," *Psychological Bulletin* 101 (1987): 171–191.

†This is not to say that students don't have learning disabilities. Some do. This discussion does not apply to students with learning disabilities.

praise *processes*, rather than ability (e.g., by following "Good job" with "you must have worked hard" instead of "you're smart").[‡] In addition to praising effort (when appropriate), you might praise a student for persistence in the face of challenges or for taking responsibility for her work. Avoid insincere praise, however. Dishonest praise is actually destructive. If you tell a student, "Wow, you really worked hard on this project!" when the student knows good and well that she didn't, you lose credibility.

2. Tell Them That Hard Work Pays Off

Praising process rather than ability sends the unspoken message that intelligence is under the student's control. There is no reason not to make that message explicit as well. I once had a student who was on the football team and devoted a great deal of time to practice, with little time left over for academics. But he attributed his poor grades to the fact that he was "a dumb jock." I had a conversation with him that went something like this:

> *D.T.W.*: Is there a player on the team who has a lot of natural ability, but who just doesn't work very hard, goofs off during practices, and that sort of thing?
>
> *Student*: Of course. There's a guy like that on every team.
>
> *D.T.W.*: Do the other players respect him?
>
> *Student*: Of course not. They think he's an idiot because he's got talent that he's not developing.
>
> *D.T.W.*: But don't they respect him because he's the best player?
>
> *Student*: He's not the best. He's good, but lots of other guys are better.
>
> *D.T.W.*: Academics is just the same. Most people have to work really hard at it. There are a few who get by without working very hard, but not many. And nobody likes or respects them very much.

3. Treat Failure as a Natural Part of Learning

If you want to increase your intelligence, you have to challenge yourself. That means taking on tasks that are a bit beyond your reach, and that means you may very well fail, at least the first time around. Fear of failure can therefore be a significant obstacle to tackling this sort of challenging work. But failure should not be a big deal. Michael Jordan put it this way: "I've missed more than 9,000 shots in my career. I've lost almost 300 games. Twenty-six times, I've been trusted to take the game winning shot and missed. I've failed over and over and over again in my life. And that is why I succeed."

Try to create a classroom atmosphere in which failure, while not desirable, is neither embarrassing nor wholly negative. Failure means you're about to learn something. You're going to find out that there's something you didn't understand, or didn't know how to do. Most important, *model* this attitude for your students. When you fail—and who doesn't?—let them see you take a positive, learning attitude.

4. Don't Take Study Skills for Granted

Make a list of all of the things that you ask students to do at home. Consider which of these things have other tasks embedded in them, and ask yourself whether the slower students really know how to do them. For older students, if you announce that there will be a quiz, you assume that students will study for it. Do your slower students really know how to study? Do they know how to assess the importance of different things that they've read and heard and seen? Do they know how long they ought to study for a quiz? (At the college level, my low-performing students frequently protest their low grades by telling me, "But I studied for three or four hours for this test!" I know that the better students study about 20 hours.) Do your slower students know some simple tricks to help plan and organize their time? Don't take for granted that your slower students have these skills, even if they *should have* acquired them in previous grades.

5. Catching Up Is the *Long-Term* Goal

It is important to be realistic about what it will take for students to catch up. The more you know, the easier it is to learn new things. Thus, if your slower students know less than your brighter students, they can't simply work at the same pace as the bright students; doing only that, they will continue to fall behind! To catch up, slower students must work *harder* than the brighter students.

6. Show Students That You Have Confidence in Them

Ask 10 people you know, "Who was the most important teacher in your life?" I've asked dozens of people this question and have noticed two interesting things. First, most people have a ready answer. Second, the reason that one teacher made a strong impression is almost always emotional. The reasons are never things like, "She taught me a lot of math." People say things like, "She made me believe in myself" or "She taught me to love knowledge." In addition, people tell me that their important teacher set high standards and believed that they could meet those standards.

In considering how to communicate that confidence to your students, we return to the subject of praise. Be wary of praising second-rate work from your slower students. Suppose you have a student who usually fails to complete his work. He manages to submit a project on time, but it's not very good. It's tempting to praise the student—after all, the fact that he submitted something is an improvement over his past performance. But consider the message that such praise sends. You say, "Good job," but that really means, "Good job *for someone like you*." The student is probably not so naïve as to think that his project is really all that great. By praising substandard work, you send the message that you have lower expectations for this student. Better to say, "I appreciate that you finished the project on time, and I thought your opening paragraph was interesting. But I think you could have done a better job organizing it. Let's talk about how." That way, you send the message that you know the student can improve.

–D.T.W.

Small differences in genetic inheritance can steer people to seek different experiences in their environments. These environmental differences, especially long term, have large cognitive consequences.

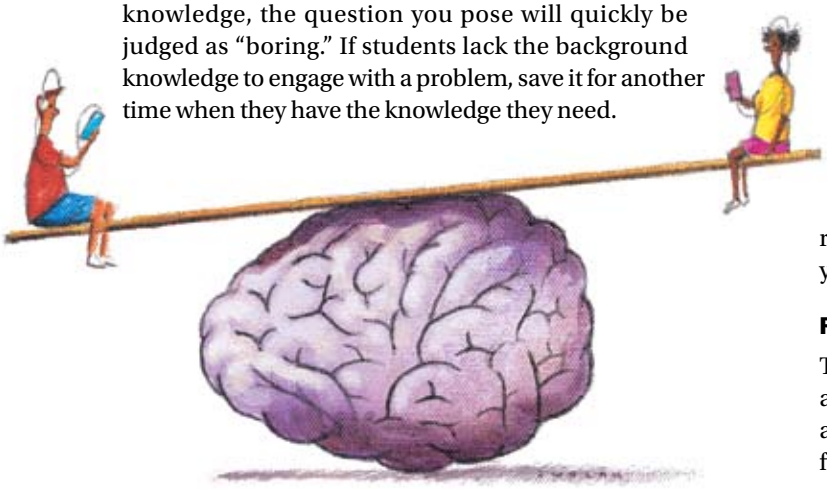
[‡]Claudia M. Mueller and Carol S. Dweck, "Praise for Intelligence Can Undermine Children's Motivation and Performance," *Journal of Personality and Social Psychology* 75 (1998): 33–52

(Continued from page 9)

students being unlikely to solve the problem, or students simply trying to guess what you would like them to say or do.

Respect Students' Limited Knowledge and Space in Working Memory

When trying to develop effective mental challenges for your students, bear in mind the cognitive limitations discussed here. For example, suppose you began a history lesson with a question: "You've all heard of the Boston Tea Party; why do you suppose the colonists dressed as Indians and dumped tea in the Boston harbor?" Do your students have the necessary background knowledge in memory to consider this question? What do they know about the relationship of the colonies and the British crown in 1773? Do they know about the social and economic significance of tea? Could they generate reasonable alternative courses of action? If they lack the appropriate background knowledge, the question you pose will quickly be judged as "boring." If students lack the background knowledge to engage with a problem, save it for another time when they have the knowledge they need.



Equally important is the limit on working memory. Remember that people can only keep so much information in mind at once. Overloads to working memory are caused by things like multistep instructions, lists of unconnected facts, chains of logic more than two or three steps long, and the application of a just-learned concept to new material (unless the concept is quite simple). The solution to working memory overloads is straightforward: slow the pace and use memory aids, such as writing on the blackboard, that save students from keeping as much information in working memory.

Identify Key Questions and Ensure That Problems Are Solvable

How can you make the problem interesting? A common strategy is to try to make the material "relevant" to students. This strategy sometimes works well, but it's hard to use for some material. I remember my daughter's math teacher telling me that he liked to use "real world" problems to capture his students' interest, and gave an example from geometry that entailed a ladder propped against a house. I didn't think that would do much for my 14-year-old. Another difficulty is that a teacher's class may include two football fans, a doll collector, a NASCAR enthusiast, a horseback riding competitor—you get the idea. Our curiosity is provoked when we perceive a problem that we believe we can solve. What is the question that will engage students and make them want to know the answer?

One way to view schoolwork is as a series of *answers*. We want students to know Boyle's law, or three causes of the U.S. Civil War, or why Poe's raven kept saying "Nevermore." Sometimes I think that we, as teachers, are so eager to get to the answers that we do not devote sufficient time to developing the question. But it's the *question* that piques people's interest. Being told an answer doesn't do anything for you. When you plan a lesson, you start with the information you want students to know by its end. As a next step, consider what the key question for that lesson might be, and how you can frame that question so that it will be of the right level of difficulty to engage your students, and will respect your students' cognitive limitations.

Our curiosity is provoked when we perceive a problem that we believe we can solve. What is the question that will engage students and make them want to know the answer?

Reconsider When to Puzzle Students

Teachers often seek to draw students in to a lesson by presenting a problem that they believe interests students, or by conducting a demonstration or presenting a fact that they think students will find surprising. In either case, the goal is to puzzle students, to make them curious. This is a useful technique, but it's worth considering whether these strategies might also be used not at the beginning of a lesson, but *after* the basic concepts have been learned. For example, a classic science demonstration is to put a burning piece of paper in a milk bottle and then put a boiled egg over the bottle opening. After the paper burns, the egg is sucked into the bottle. Students will no doubt be astonished, but if they don't know the principle behind it, the demonstration is like a magic trick—it's a momentary thrill, but one's curiosity to understand may not be long lasting. Another strategy would be to conduct the demonstration after students know that warm air expands and that cooling air contracts, potentially forming a vacuum. That way they can use their new knowledge to think about the demonstration, which is no longer just a magic trick.

Act on Variations in Student Preparation

As I describe in the sidebar on page 10, I don't accept that some students are "just not very bright." But it's naïve to pretend that all students come to your class equally prepared to excel; they have had different preparation, as well as different levels of support at home, and they will, therefore, differ in their current abilities. If that's true, and if what I've said in this article is true, it is self-defeating to give all of your students the same work or to offer all of them the same level of support. To the extent that you

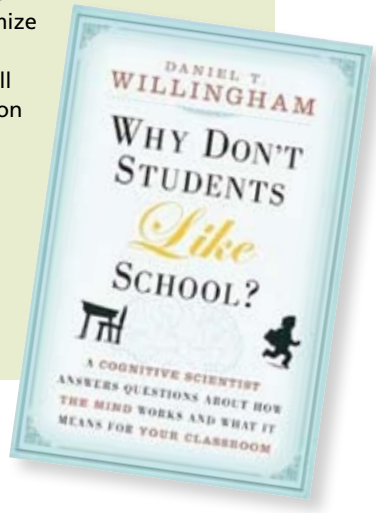
Why Don't Students Like School? began as a list of nine principles that are so fundamental to the mind's operation that they are as true in the classroom as they are in the laboratory, and therefore can reliably be applied to classroom situations. Many of these principles likely won't surprise you: factual knowledge is important, practice is necessary, and so on. What may surprise you are the implications for teaching that follow. You'll discover that authors routinely write only a fraction of what they mean, which I'll argue implies very little for reading instruction, but a great deal for the factual knowledge that your students must gain. You'll explore why you remember the plot of *Star Wars* without even trying, and you'll learn how to harness that ease of learning for your classroom. You'll follow the brilliant mind of the television doctor Gregory House as he solves a case, and you'll discover why you should *not* try to get your students to think like real scientists.

Cognitive scientists do know more about the mind than these nine principles. These nine were selected because they meet the following four criteria.

1. Each principle is true *all* the time, whether the person is in the laboratory or the classroom, alone or in a group.
2. Each principle is supported by an enormous amount of data, not just a few studies.
3. Using the principle can have a big impact on student learning.
4. Each principle suggests classroom applications that teachers might not already know.

Education is similar to other fields of study in that scientific findings are useful, but not decisive. Cognitive principles do not prescribe how to teach, but they can help you predict how much your students are likely to learn. If you follow them, you maximize the chances that your students will flourish. Education makes better minds, and knowledge of the mind can make better education.

–D.T.W.



can, I think it's smart to assign work to individuals or groups of students that is appropriate to their current level of competence, and/or to offer more (or less) support to students depending on how challenging you think they will find the assignment. Naturally, one wants to do this in a sensitive way, minimizing the extent to which these students will perceive themselves as behind the others. But the fact is that they *are* behind the others; giving them work that is beyond them is unlikely to help them catch up, and is likely to make them fall still further behind.

Change the Pace

Change grabs attention, as you no doubt know. When you change topics, start a new activity, or in some other way show that you are shifting gears, virtually every student's attention comes back to you. So plan these shifts and monitor your class's attention to see whether you need to make them more often or less frequently.

Keep a Diary

The core idea presented in this article is that solving a problem gives people pleasure, but the problem must be easy enough to be solved yet difficult enough that it takes some mental effort. Finding this sweet spot of difficulty is not easy. Your experience in the classroom is your best guide. But don't expect that you will remember how well a lesson plan worked a year later. When a lesson goes brilliantly well or down in flames, it feels at the time that we'll never forget what happened; but the ravages of memory can surprise us, so write it down. Even if it's just a quick scratch on a sticky note, try to make a habit of recording your success in gauging the level of difficulty in the problems you pose for your students. ❑

For Further Reading

Less Technical

Mihaly Csikszentmihalyi, *Flow: The Psychology of Optimal Experience* (New York: Harper Perennial, 1990). The author describes the ultimate state of interest, when one is completely absorbed in what one is doing to the point that time itself stops. The book does not tell you how to enter this state yourself, but is an interesting read in its own right.

Steven Pinker, *How the Mind Works* (New York: W. W. Norton, 1997). This book covers not only thinking, but emotion, visual imagery and other related topics. Pinker is a wonderful writer, and draws in references from many academic fields, and from pop culture. Not for the faint-hearted, but great fun if the topic appeals to you.

More Technical

Alan Baddeley, *Working Memory, Thought, and Action* (London: Oxford University Press, 2007). Written by the originator of the working memory theory, this book summarizes an enormous amount of research that is consistent with that theory.

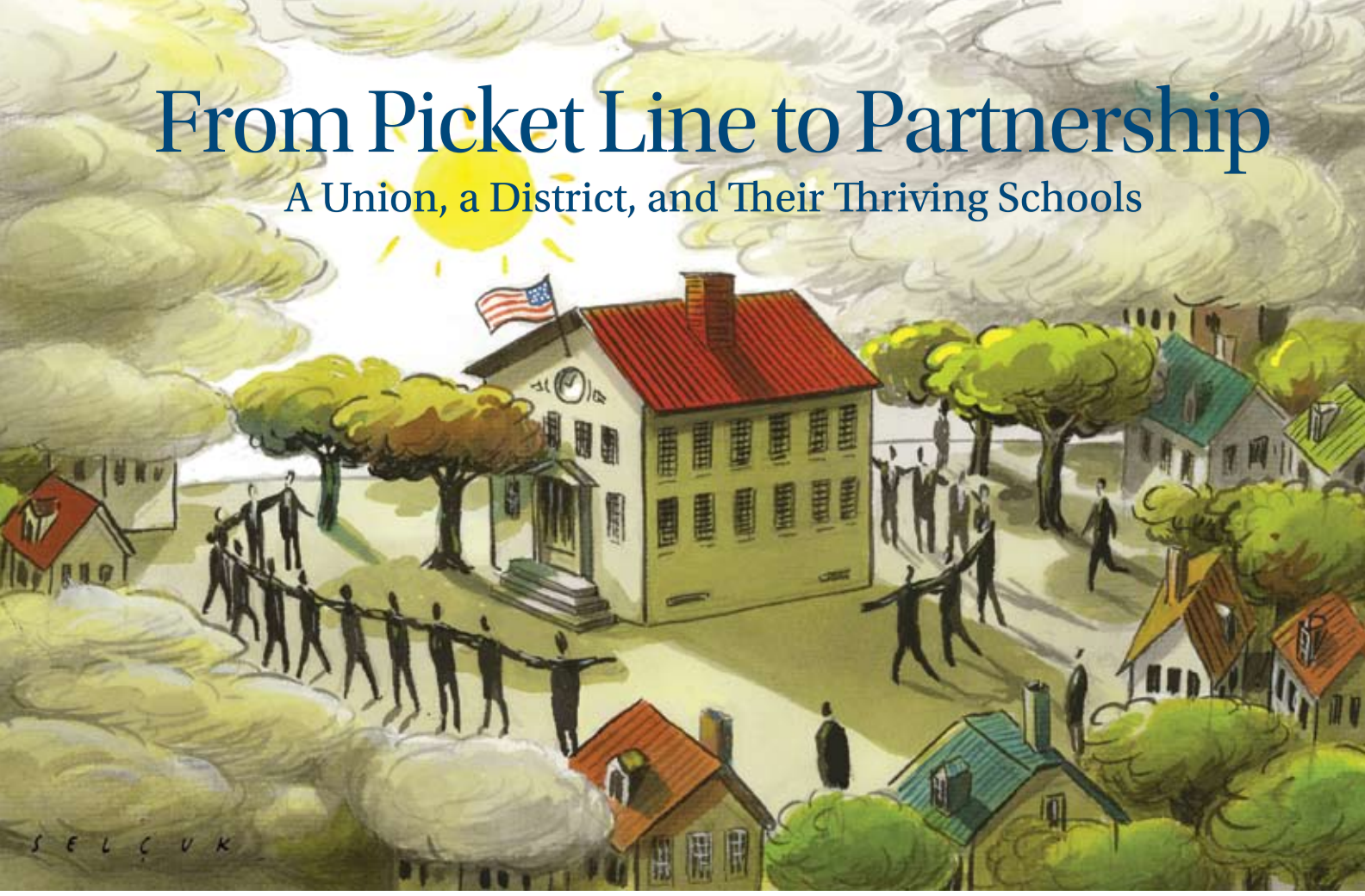
Wolfram Schultz, "Behavioral Dopamine Signals," *Trends in Neurosciences* 30 (2007): 203–210. A review of the role of dopamine, a neurochemical, in learning, problem solving, and reward.

Paul J. Silvia, "Interest—The Curious Emotion," *Current Directions in Psychological Science* 17 (2008): 57–60. The author provides a brief overview of theories of interest, highlighting his own, which is similar to the account provided here: we evaluate situations as interesting if they are novel, complex, and comprehensible.

Daniel T. Willingham, *Cognition: The Thinking Animal,* 3rd ed. (New York: Prentice Hall, 2007). This is a college-level textbook on cognitive psychology, and can serve as an introduction to the field. It assumes no background, but it is a textbook, and so although it is thorough, it might be a bit more detailed than you would want.

From Picket Line to Partnership

A Union, a District, and Their Thriving Schools



ILLUSTRATED BY SELÇUK DEMIREL

By Jennifer Dubin

On October 21, 1993, the day before her members went on strike, Laura Rico experienced a swirl of emotions: anger, fear, nervousness. Her union, the ABC Federation of Teachers, and her district, ABC Unified, had reached an impasse in contract negotiations. The district wanted to cut teachers' pay and health benefits, and increase class size. A strike was Rico's choice of last resort. As union co-president, she had notified the district that a majority of her members had voted to walk out of their classrooms. The night before they did so, Rico never made it home. For 24 hours she and a colleague stayed in the union office answering the phone. Teachers called to ask questions and to show their support.

For eight days, tensions ran high, especially when a principal turned on her school's lawn sprinklers to soak striking teachers. The superintendent at the time, Larry Lucas, also protested. Each day of the strike, he would send Rico a Western Union telegram telling her the strike was illegal. Amused but not deterred, Rico posted each telegram in the hall of the union office so she and her staff could share a laugh.

Today in ABC,* teachers don't need to picket and the superintendent wouldn't dare communicate with the union president via telegram. In this district 20 miles southeast of Los Angeles, there exists a successful labor-management partnership. Comprised of the cities of Artesia, Cerritos, and Hawaiian Gardens, as well as parts of Lakewood, Long Beach, and Norwalk, the district has its share of high-performing schools with affluent or middle-class students, as well as schools that have historically struggled with low-performing students, many of whom live in the district's impoverished South Side. Shortly after the strike, a new superintendent was hired and Rico extended an olive branch in an effort to end the hostilities. Since then she has partnered with successive superintendents to focus on improving teaching and learning—especially in the South Side.

Rico and the current superintendent, Gary Smuts, meet weekly. Their deputies meet monthly. And members of both the union's executive board and the superintendent's cabinet routinely call each other. The constant communication helps resolve problems and keep everyone's time, money, and attention focused on boosting student achievement. The union and the district also cosponsor parent nights and professional development conferences specifically for the South Side schools. Not surprisingly, those schools have thrived thanks to the increased support.

District and union leaders in ABC believe they can do more for their students if they work together. And so, they are taking their partnership a step further. They are fostering an atmosphere

Jennifer Dubin is assistant editor of American Educator. *Previously, she was a journalist with the* Chronicle of Higher Education.

*The name ABC comes from the unification of Artesia, Bloomfield, and Carmenita school districts in 1965.

of collaboration within the schools themselves. Principals and building representatives, districtwide, now meet anywhere from once a week to once a month to discuss ways to improve instruction.

Sure, some teachers and administrators are wary of all this cooperation, but Rico and Smuts are nudging them along. Both want the few remaining skeptics to follow their example. And they hope partnerships elsewhere will begin to catch on. "I am a better superintendent because I have a strong union president," Smuts says. To some, that might sound like heresy. To him, it just makes sense. After all, he says, "we both want what's best for kids."

A Successful Strike

Given the turmoil of the strike, few could have predicted the goodwill that exists today. In 1993, the district claimed financial trouble. Because of the bad economic situation, the union compromised with the district and tentatively agreed to significant cuts in pay and health benefits. Soon after, the district found an extra $1.8 million in its budget. The union then asked the district to spend that money on reinstating the things that teachers had given up. Teachers wanted the district to rescind the two furlough days, award them a 5 percent bonus, and eliminate increased medical copayments and larger class sizes. The superintendent and his cabinet, however, refused to negotiate. They wanted to save some of the $1.8 million in case of an economic downturn. The rest they wanted to spend on new programs and pay increases for themselves.

On October 22, the union called a strike. Sixty percent of the district's 1,200 teachers walked out that first day. Nearly 500 walked picket lines each of the strike's eight days.

"The one thing the district didn't count on was that the union knew the community," says Rico, union co-president† at the time. She remembers how the city of Hawaiian Gardens, where the ABC Federation of Teachers' office is located, passed an ordinance to allow teachers to park on the street and picket in front of schools without having their cars towed. Local churches held candlelight vigils for teacher marches. And parents brought lunches for striking teachers at the district's 29 schools.

At the time, the majority of the school board members supported the superintendent. Since teachers had gone on strike a little less than two weeks before the school board election, Rico and her colleagues saw an opportunity to have union members campaign for school board candidates and help elect a new board. Teachers canvassed neighborhoods and knocked on doors, asking parents of their students to vote for the union-backed candidates. "We were doing a strike and also running an election," Rico recalls.

Both efforts paid off. On November 2, the union-endorsed candidates won the election, giving the union a majority of sympathetic school board members. The next day, the union called off the strike and teachers returned to work. The new school board directed the superintendent at the time, Larry Lucas, to return to the negotiating table with the ABC Federation of Teachers (ABCFT). The talks failed. In January, the board fired him.

Because the union had helped elect like-minded school board members, the school board members in turn hired a like-minded superintendent. Tom Riley took the helm of ABC in 1995. Rico remembers being cautiously optimistic upon his appointment. "There was just so much bad feeling" across the district, she says. The strike had caused friends to lose friends. And teachers didn't trust the district office. Still, she made the first move. "I stuck out my hand to the new superintendent and said 'let's work together.' "

Some school administrators also reached out to her. During the strike, Gary Smuts was principal of Cerritos High School. When it ended, he and another colleague met with Rico to see if she could ask Riley to rescind a rule, established by the former superintendent, that administrators could be fired for having philosophical differences from the superintendent. Smuts says that administrators at the time had no political power, but the union did. Rico agreed to their request and Riley listened to her. "To Tom's credit," Smuts says, "he told the board, 'This is no longer an operating practice. We encourage debate.' "

> "I am a better superintendent because I have a strong union president."
>
> —GARY SMUTS

Smuts is grateful for Rico's help. In the traditional union-management relationship, a union president would want the superintendent to suppress principals, he says. That way, the union could foster its own disproportionate power. But principals can't work effectively if they're constantly afraid of losing their jobs, which Rico understands. Ultimately, the experience taught Smuts an important lesson about the union president: "I can rely on this person."

Within a few months, relations between the union and the district had started to improve. While there was no partnership yet, both union leaders and district officials had begun working toward a more collegial relationship. By inviting both groups to meet with him together in his office, Riley had them talking again. "He had an ability to heal," Rico says.

Then tragedy struck. In October of 1998, after only three years as superintendent, Riley died of leukemia. The next month, a school board member committed suicide. With the community reeling from two terrible losses and interim superintendents coming and going, the relationship between the union and the district stalled. Finally in 1999, the school board hired Ron Barnes.

Around that time, Rico, received a flier from the American Federation of Teachers, the national union with which ABCFT is affiliated, promoting a weeklong seminar at Harvard University on labor-management relations in public schools. Rico wanted to attend and asked Barnes to go too. Since the Harvard seminar started a week before Barnes was to begin his new job at ABC

†Laura Rico was co-president of ABC Federation of Teachers from 1991 to 1996. She became the sole president in 1996.

PHOTO COURTESY OF HAWAIIAN ELEMENTARY SCHOOL

PHOTOS COURTESY OF ABCFT

At left, students at Hawaiian Elementary hold "Rising Star" awards in recognition of their achievement on state assessments. Over the past several years, Hawaiian has greatly increased student achievement, largely thanks to support from the labor-management partnership.
Below left, ABC teachers and children wave picket signs during the 1993 strike that ultimately resulted in a new school board, a new superintendent, and a new partnership between the union and the district.

and his former district would not release him early, he suggested Rico take others instead. She attended the seminar along with the district's two human resources directors, four school board members, members of the ABCFT executive board, and the presidents of the district's two other unions, the American Federation of State, County and Municipal Employees (which represents the district's bus drivers, maintenance workers, painters, roofers, welders, and cafeteria workers) and the California School Employees Association (which represents support staff, including secretaries and paraprofessionals). The seminar helped jump-start the partnership. "Anyone can say, 'Let's work together,'" Rico says. "What does that really mean?"

It meant that members of the group had to listen and talk to each other. During the weeklong seminar, they learned about each other's jobs and shared their ideas for improving their community. When they returned to the district, they met with Barnes, who had just started his job. Rico remembers that he was receptive to what they had learned. They both decided, though, that "we needed to really develop our relationship first."

The following week, Rico and Barnes talked further. They decided to meet once a week. "At first, we thought we wouldn't have anything to talk about every week," Rico says. But they soon found they had more than enough to discuss in the closed-door meetings, which they promised to keep confidential. Rico kept Barnes informed of people in the community who were sowing conflict or had an axe to grind or simply wanted to run for school board. She also would tell him of problems that teachers were having with principals. Barnes would share his concerns about certain schools. Rico says they did not discuss salaries, health benefits, transfers, or leaves of absence during these meetings. "In this partnership, things that are to be done at the [bargaining] table are done at the table." Rico and Barnes also created 12 guiding principles (see box on page 19) that formed the basis of their professional relationship (and that Rico and current superintendent Smuts follow to this day). One of the most frequently mentioned by union members and administrators is No. 11: "We don't let each other fail."

South Side Support

There was a time, though, when the district was failing some of its students. In 1999, Rico remembers Margene Millette, a union member and former strike captain, storming into her office. "I can't spend half a year reteaching because there's a person next door who doesn't know what the hell they're doing," Rico says Millette told her. "This is not fair. These kids need more help."

"These kids" were Millette's students at Hawaiian Elementary. One of six schools located on the South Side, the school then, as now, enrolled mostly Hispanic students from low-income families with limited English. In 2007-08, the school year for which most recent figures are available, 96 percent of the students who attended the 530-student school were Hispanic, 69 percent were English language learners, and 100 percent received free or reduced-price meals. Comparatively, only 20 percent of the district's 20,860 students were English language learners and just 37 percent received free or reduced-price meals that year.

While some homes in the more affluent city of Cerritos sell for a million dollars, it's not uncommon to have multiple families living in single-family homes in the city of Hawaiian Gardens.

The union and the district formed the South Side Reading Collaborative, through which they jointly sponsored professional development conferences to improve instruction in reading.

Laurie Cordova, Hawaiian Elementary's principal for the last three years, says that many of her students grow up raising younger siblings or moving in and out of relatives' homes. "Their life is very inconsistent," she says. "The teachers here are their consistency." The neighborhood in which the school is located reflects that transience. A casino, two bingo halls, a Food 4 Less, a Coin Laundry, and The Way Out Ministries dot the strip-mall landscape.

When Millette first came to Hawaiian Elementary 16 years ago, she experienced a bit of culture shock. "I had a fifth-grade class," she says. "I couldn't even use my third-grade materials with them. They were academically behind." Millette had previously taught gifted and talented students at Mary Bragg Elementary in Cerritos. That experience had not prepared her for this one. At the time, many teachers at Hawaiian had emergency credentials, and the school was using a variety of reading programs.

Millette persuaded Rico, her union president, to do something about it. Rico talked to Barnes. "I said to him, 'This can't go on anymore. Don't hire anyone in this district without a credential.' " Barnes and the district's director of human resources met with Rico and her executive board. They discussed how for years the district had been forced to hire emergency credentialed teachers because of a teacher shortage. So together they devised ways to make ABC a more attractive place to work. It took a couple years to work out the details. During 2001 and 2002, the union and the district restructured the salary schedule to raise beginning teacher salaries from $36,319 to $40,225 (beginning salaries now start at just under $45,000). The district also increased its years-of-service credit from 9 years to 12, meaning that if a teacher taught 15 years in another district then moved to ABC, the district would recognize 12 of those years in determining the teacher's salary.

The union and the district also beefed up recruiting in the South Side schools. Teachers received a $5,000 signing bonus to work in any of the six schools. Also, "there were student teachers here that we wanted to nurture," Rico says. So district officials told student teachers in ABC that the district would pay for their last year of college if they agreed to work in a South Side school for at least two years.

To spread the word that ABC wanted to hire top-notch teachers, the district bought time at local movie theaters and advertised an upcoming job fair on movie trailers. Moviegoers paid attention. At that first job fair, 2,000 people stood in line to apply for roughly 60 positions. Since then, ABC job fairs have attracted 700 to 800 applicants each year for approximately 35 jobs. Rico and her colleagues in administration point out that the district made having highly qualified teachers in every school a priority before No Child Left Behind, the federal education law, did.

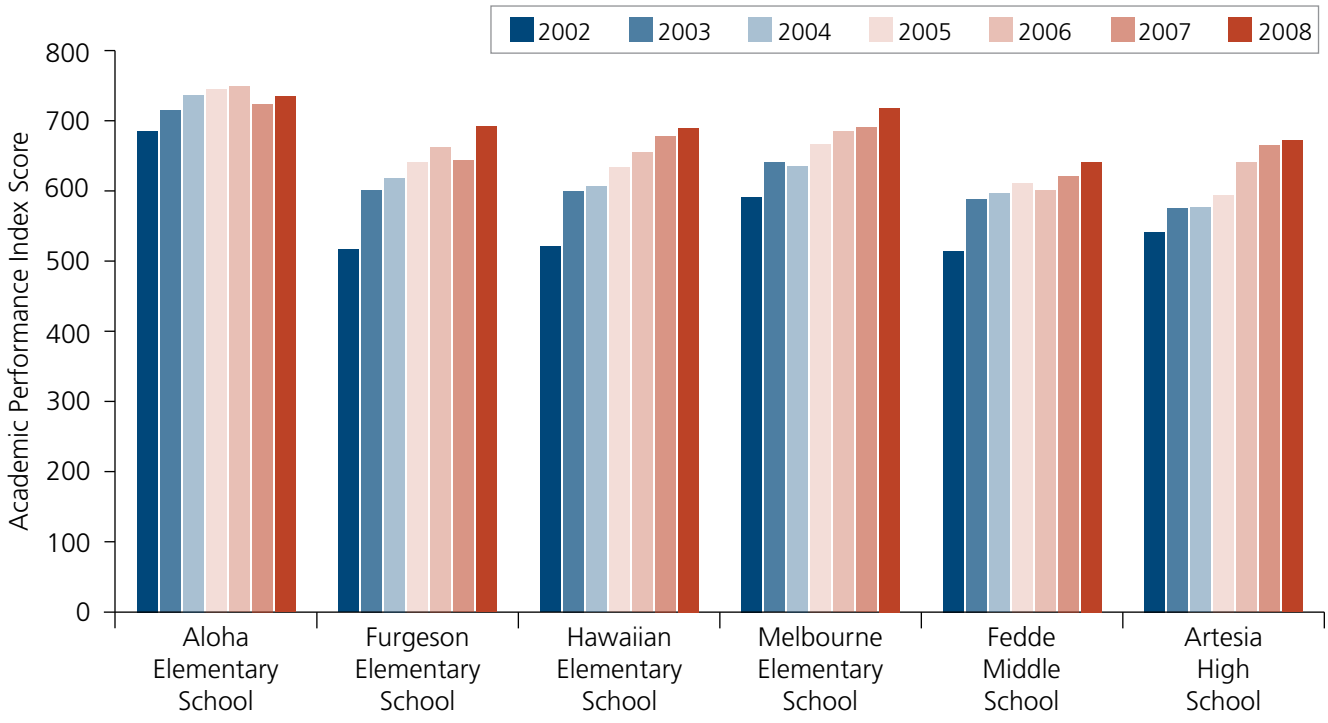
Carol Hansen, the assistant superintendent of human resources, notes that 99 percent of ABC's 2,000 teachers are fully credentialed. In the district's South Side schools, 100 percent of teachers are fully credentialed. And just as important, on average, teachers in the South Side schools have 13 years of experience. Districtwide, on average, teachers have 16 years. Although the district no longer offers the $5,000 signing bonus for working in the South Side schools, both Hansen and Rico say teachers still want to work in them and few ever leave. "It's because they're well taken care of," Hansen says. "There's support."

The union and the district did more than strengthen teacher recruitment in the South Side schools. They also focused on improving the curriculum. "If you don't know how to read, that's a death sentence, especially if you can't speak English very well," Rico says. So the union and the district formed the South Side Reading Collaborative, through which they jointly sponsored professional development conferences to improve instruction in reading. The schools also received additional funds to purchase a reading program of their choice. The superintendent's only requirement was that it be research based. Thanks to support from the American Federation of Teachers, district administrators and building representatives visited Houston, Texas, in 2001 to observe research-based programs. Teachers and administrators at Hawaiian Elementary chose Success for All, which the school still uses today. Other South Side schools chose Houghton Mifflin Reading.

Millette, who served as a building representative at that time, appreciates that teachers had the freedom to pick a program. And she values the consistency that having the same program throughout her school provides. In South Side schools, like Hawaiian, teachers can now discuss ways to improve instruction across grade levels. Besides fostering a more collaborative environment, the partnership has ultimately allowed for better teaching, which in turn has led to better student results (see the chart on page 18).

South Side Schools Show Steady Gains

The labor-management partnership between the ABC Federation of Teachers and the ABC Unified School District has allowed teachers and administrators to focus on boosting academic achievement, especially in the six historically low-performing schools on the district's South Side. The chart below shows that student achievement in these six schools has been increasing for many years, due in part to initiatives like the South Side Reading Collaborative.



The Academic Performance Index (API) is a numeric index used by the state of California to measure the academic performance and growth of schools (as well as student subgroups and school districts). It ranges from a low of 200 to a high of 1,000. Although the statewide performance target for all schools is 800, each year a growth target—of, for example, 5 points—is set for each school. The API is calculated using results from the California High School Exit Examination and from the Statewide Testing and Reporting Program, which together test English language arts, mathematics, science, and history-social science. (To learn more about the API, see **www.cde.ca.gov/ta/ac/ap/documents/infoguide07b.pdf**. School data for the chart were drawn from **www.cde.ca.gov/ta/ac/ap/apireports.asp**.)

The Partnership Grows

Student achievement has continued to climb and the partnership has continued to grow despite changes in district leadership. When Ron Barnes retired in 2005, the school board hired Gary Smuts, then the deputy superintendent. "They wanted somebody who would foster the relationship" between the union and the district, Smuts says. Upon his appointment, he pledged to continue the initiatives that Barnes and Rico had started. One of those was the partnership's leadership team.

In 1999, ABCFT had a retreat for building representatives and Barnes asked if ABC principals could join them for the part that focused on the district's budget and the union contract. Rico and the union executive board said that principals were welcome to attend. At the retreat, which Barnes and Rico dubbed "Partnership with Administration and Labor" (P.A.L.), the union's chief negotiator and the district's human resources director did a joint presentation. "It went so well we decided we'd plan our next P.A.L. retreat together," Rico says.

Of course, there was resistance at first because the strike was still fresh in principals' minds. Laurie Cordova, who at the time of the retreat was principal of Benito Juarez Elementary, says that many principals did not want to attend. "They can shove us together all they want. This won't work," she remembers some of the principals saying to each other. Neither building representatives nor principals especially liked the retreat's assigned seating: building representatives had to sit with their principals, an arrangement that exists today. "There was still some animosity," says Margene Millette, who was then the building representative at Hawaiian. "You're thinking, 'I don't even like my principal.'"

Gradually, those hard feelings began to soften, as the union and the district held a P.A.L. retreat for building representatives and principals every year at a local hotel. As partners, the union and the district split the cost. They also invite a keynote speaker each year. One year early on in the partnership, the speaker was Linda Kaboolian, who taught the labor-management seminar at Harvard that the ABC group attended; she provided some initial guidance for the partnership. Last year, Saul Rubinstein, professor of labor studies and employment relations at Rutgers University, spoke about the factors that help sustain partnerships over the long term. Rubinstein also spoke at the 2007 P.A.L.

At the retreats, principals and building representatives discuss ways to improve their relationships with each other and strategies for improving student achievement.

retreat, where he discussed the history of union-management partnerships in the United States, how the union and the district could plan initiatives for school improvement together, and how to take the partnership deeper into schools.

At the retreats, principals and building representatives discuss their strengths and weaknesses as a team and ways to improve their relationships with each other. They also discuss strategies for improving student achievement, which remains the focus of every P.A.L. retreat.

To strengthen the retreat and the partnership, in 2005 Smuts and Rico created a P.A.L. leadership team, which meets at least two to three times a year. The team is made up of 21 people: the superintendent and his cabinet, and the union president and her executive board. Ray Gaer, the union's vice-president at-large, is the union's point person, and Mary Sieu, ABC's deputy superintendent, is the district's point person. Both Gaer and Sieu set the agenda for each P.A.L. retreat.

Members of the team often call each other or meet in person to discuss problems. For example, Rico and Hansen, the assistant superintendent of human resources, enjoy a rapport that allows both women to politely raise red flags. Given California's budget crisis this year, Hansen's office recently reorganized staffing ratios. Declining enrollment in the district meant that schools needed fewer special education teachers. This year, there were more teacher openings in regular education. So the human resources office, with the union's help, asked for teachers from special education to volunteer for regular education positions. "The union helped us paint it as an opportunity," Hansen says. Rather than just sending the teachers a memo about changes in their teaching assignments, Hansen met with Rico first and they devised this plan.

Filtering that kind of collaboration down into the schools was the focus of this year's P.A.L. retreat. "The partnership improves the more it begins to spread out," Smuts says.

For instance, students at Haskell Middle School in Cerritos have benefited from improved relations between administrators and teachers. Leonore Bello, a math teacher and a building representative there, enjoyed a good working relationship with the school's former principal, Susan Hixson. Hixson, who recently became director of human resources at the district level, says as soon as Bello became the building representative, the two discussed their goals and objectives. "We wanted to see every student be successful."

At one of their weekly meetings four years ago, Hixson and Bello decided the school needed an intervention program for students having trouble in math. So Bello wrote a grant for state funding of a program where teachers earn extra money to help students outside of class three days a week—before, during, and after school. Bello has run the program ever since. Before Bello won the grant, Hixson had tried to establish an intervention program, but only two teachers participated. With Bello running the program, about 20 teachers now commit to staying after school.

Bello also helped Hixson with another project: changing the school's start date. Only seventh- and eighth-graders attend Haskell, and for years Hixson and several teachers wanted seventh-graders to start a day earlier to help them adjust. The contract requires a school to have 100 percent teacher support for any change in start times. "For several years, we couldn't get it passed," Bello says. Finally, she persuaded her colleagues to approve the change. Bello says she gladly worked with her principal "because if the teachers aren't happy, nothing's going to fly." Hixson says she appreciated Bello's ability to work with everyone at the school. "Her strength is that she has a really good

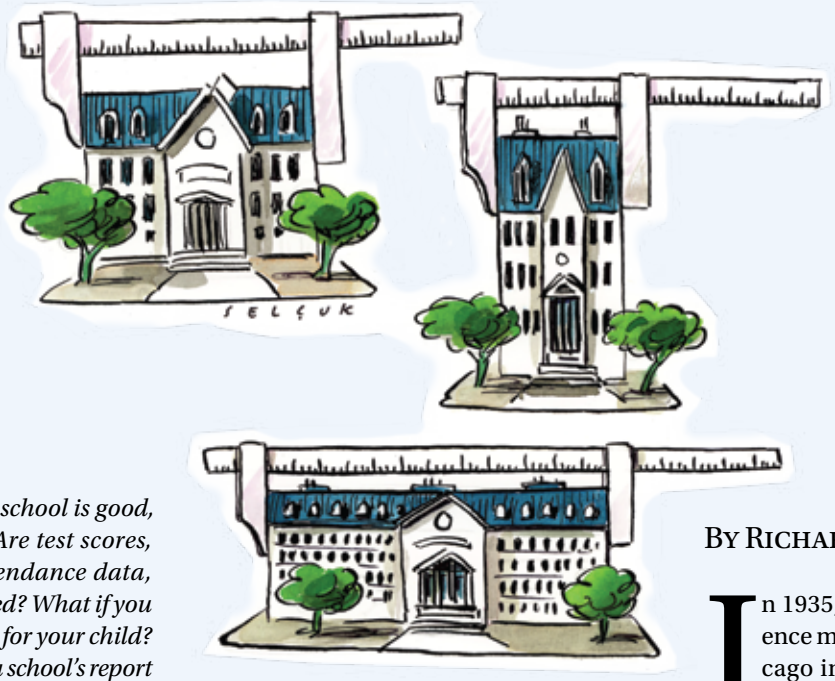
(Continued on page 40)

Guiding Principles

Laura Rico, ABC Federation of Teachers president, and Gary Smuts, ABC superintendent, adhere to these 12 principles to help strengthen the district's labor-management partnership.

1. We will work hard to understand the core of each other's job.
2. We will respect each other.
3. We will be honest with each other.
4. We will not "sugar coat" difficult issues.
5. We will disagree without being disagreeable.
6. We will reflect on each other's comments, suggestions, and concerns.
7. We will seek clarification until we understand.
8. We will maintain confidentiality.
9. We will both "own the contract."
10. We solve problems rather than win arguments.
11. We don't let each other fail.
12. We will laugh at ourselves and with each other.

What's Wrong with Accountability by the Numbers?



ILLUSTRATED BY SELÇUK DEMIREL

How do you know if a school is good, bad, or in-between? Are test scores, graduation rates, attendance data, and the like all you need? What if you were selecting a school for your child? Would you just review a school's report card online, or would you schedule a visit so that you could get to know the principal, observe a few classes, and even interview some students? Would you contact some parents, check out the neighborhood, and look for nearby after-school activities? We hope that you would both pay attention to the data and *pay a visit to the school. And so we wonder: why would our education accountability system do anything less?*

In this article, Richard Rothstein explores the well-established problems—in education, health care, and other fields—with accountability systems that focus exclusively on quantitative data. Then, in the article that follows (see page 24), Rothstein and his colleagues, Rebecca Jacobsen and Tamara Wilder, propose a completely new approach to accountability that's inspired in part by England's system of inspecting schools and calls for a national assessment of a full range of cognitive and noncognitive skills.

Did they get it right? That's for you to decide. Their goal is to start a conversation. Since dissatisfaction with our current accountability system is widespread, it's time to ask: what are our goals for education and how can we help all schools meet them?
–EDITORS

Richard Rothstein is a research associate at the Economic Policy Institute, former national education columnist with the New York Times, *and author of several books, including* Class and Schools: Using Social, Economic, and Educational Reform to Close the Black-White Achievement Gap. *This article is adapted with permission from* Grading Education: Getting Accountability Right, *coauthored with Rebecca Jacobsen and Tamara Wilder, published in 2008 by the Economic Policy Institute and Teachers College Press.*

By Richard Rothstein

In 1935, a 19-year-old political science major at the University of Chicago interviewed Milwaukee city administrators for a term paper. He was puzzled that, when money became available to invest in parks, school board and public works officials could not agree on whether to hire more playground supervisors or improve physical maintenance of the parks themselves. He concluded that rational decision making was impossible because "improving parks" included multiple goals: school board members thought mostly of recreational opportunities for children, while public works administrators thought mostly of green space to reduce urban density.

The next year, the director of the International City Managers' Association hired the young graduate as a research assistant. Together they reviewed techniques for evaluating municipal services, including police, fire, public health, education, libraries, parks, and public works. Their 1938 book, *Measuring Municipal Activities*, concluded that quantitative measures of performance were mostly inappropriate because public services have goals that can't easily be defined in simple numerical terms. Public services have multiple purposes and, even if precise definitions for some purposes were possible, evaluating the services overall would require difficult judgments about which purposes were relatively more important. Also, it was never possible to quantify whether outcome differences between cities were attributable to differences in effort and competence of public employees, or to differences in the conditions—difficult to measure in any event—under which agencies worked.

The senior author, Clarence E. Ridley, directed the City Man-

agers' Association until retiring in 1956. His assistant, Herbert A. Simon, went on to win the Nobel Prize in economics for a lifetime of work demonstrating that weighing measurable costs and benefits in simple numerical terms does "not even remotely describe the processes that human beings use for making decisions in complex situations."[1]

The past few decades have seen growing enthusiasm among politicians and policymakers for quantitative accountability systems that might maximize public service efficiency. But they have rushed to develop measurement systems without giving great thought to issues that Ridley and Simon raised 70 years ago.

In Great Britain a quarter century ago, Margaret Thatcher attempted to rationalize public enterprises: where they could not be privatized, her government hoped to regulate them, using rewards and sanctions for numerically specified outcomes. Tony Blair later accelerated these efforts, while in the United States, the Clinton administration's Government Performance Results Act of 1993 proposed to "reinvent government" by requiring measurable outcomes for all government agencies.

Enthusiasm for holding schools accountable for student test scores is but part of this broader trend that has proceeded oblivious to the warnings of Herbert Simon and other notable social scientists. Scholars have often concluded that, when agents in other sectors are held accountable for improving production of a simple numerical output, performance on that easily measured output does improve. *But overall performance frequently deteriorates*. So economists, sociologists, and management theorists generally caution against accountability systems that rely exclusively, or even primarily, on numerical outcome measures.

In 1975, social scientist Donald T. Campbell formulated what he called his "law" of performance measurement:

> The more any quantitative social indicator is used for social decision-making, the more subject it will be to corruption pressures and the more apt it will be to distort and corrupt the social processes it is intended to monitor.[2]

Such corruption occurs primarily because of the problem Herbert Simon identified—an indicator that can be quantified often reflects only an aspect of the outcome of interest, so undue attention to this aspect will distort the balance of services being provided.

Examples of Campbell's law abound. Motorists stopped by police for trivial traffic violations may have experienced an accountability system in which police sergeants evaluate officers by whether they meet ticket quotas. Certainly, issuing citations for traffic violations is one measure of good policing, but when officers are disproportionately judged by this easily quantifiable outcome, they have incentives to focus on trivial offenses that meet a quota, rather than investigating more serious crimes where the payoff may be less certain. The numerical accountability system generates false arrests, and creates incentives for police officers to boost their measured productivity by disregarding suspects' rights. In New York City a few years ago, the use of quantifiable indicators to measure police productivity resulted in the publicized (and embarrassing, to the police) arrest of an 80-year-old man for feeding pigeons and of a pregnant woman for sitting down to rest on a subway stairway.[3]

The annual rankings of colleges by *U.S. News and World Report* offer another example of Campbell's law. The rankings are truly an accountability system; many colleges' boards of trustees consider the rankings when determining presidential compensation. In at least one case, a university president (at Arizona State) was offered a large bonus if the university's ranking moved up on his watch.[4]

U.S. News rankings are based on several factors, including the judgments of college presidents and other administrators about the quality of their peer institutions, and the selectiveness of a college, determined partly by the percentage of applicants who are admitted (a more selective college admits a smaller percentage of applicants). Thus, the rankings are a candidate for illustration of Campbell's law, because these factors would be quite reasonable if there were no stakes attached to measuring them. College presidents and other administrators are in the best position to know the strengths and weaknesses of institutions similar to their own, and asking them for their opinions about this should be a good way to find out about college quality. But once an accountability rating is based on these answers, presidents have incentives to dissemble by giving competing institutions poorer ratings and making their own institutions appear relatively superior.

Enthusiasm for holding schools accountable for student **test scores** is part of a broader trend that has proceeded oblivious to the warnings of notable social scientists.

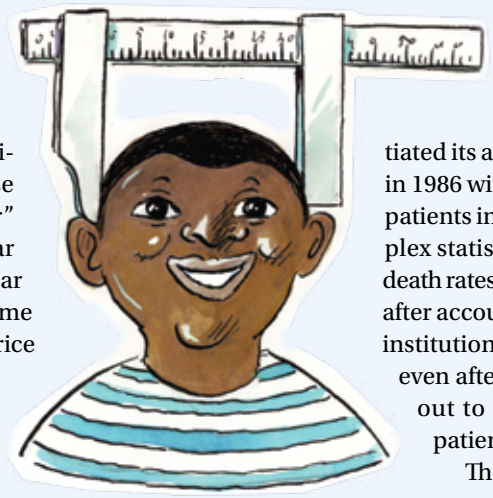
Likewise, the selectiveness of a college was once a reasonable factor to consider, since higher-quality colleges are likely to accept relatively fewer applicants because demand for admission is strong. But once this indicator became an accountability measure, colleges had an incentive to recruit applicants who were bound ultimately to be rejected. Colleges, for example, have sent promotional mailings to unqualified applicants and waived application fees in order to attract unsuccessful (and unsuspecting) applicants. The indicator nonetheless persists in the *U.S. News* rankings, although it now has questionable value.[5]

As a 1968 presidential candidate, Richard M. Nixon promised a "war" on crime. After his election, the FBI publicly reported crime statistics by city. It judged whether police departments were effective by the sum of crimes in seven categories: murder, forcible rape, robbery, aggravated assault, burglary, auto theft, and serious larceny (defined as theft resulting in a loss of at least $50). Many cities subsequently posted significant reductions in crime.[6] But the crime reductions were apparently realized by playing with crime classifications. The biggest reductions were in larcenies of $50 or more in value. Valuing larceny is a matter

of judgment, so police departments placed lower values on reported losses after the implementation of the accountability system.[7] Although the number of alleged $50 larcenies (which counted for accountability purposes) declined, the number of alleged $49 larcenies (which did not count) increased.

More Sophisticated Measures Help, But Not Enough

Probably the most obvious solution to the goal distortion that results from blunt measures is to create more sophisticated measures. But even carefully constructed quantitative measures fall short. In education, test-based accountability systems should (though often do not) adjust results for differences in student characteristics. A school with large numbers of low-income children, high residential mobility, great family stress, little literacy support at home, and serious health problems may be a better school, even if its test scores are lower, than another whose pupils don't have such challenges. Education policymakers sometimes try to adjust for these differences by comparing only "similar" schools—those, for example, with similar proportions of minority students, or similar proportions of students who are low income (eligible for the federal free and reduced-price lunch program). Such adjustments are worth making, but they don't really solve the problem. Stable working-class families, with incomes nearly double the poverty line, are eligible for the federal lunch program; schools with such students can easily get higher scores than schools with very poor students, yet the latter schools may be more effective.



Medicine faces similar problems; some patients are much sicker, and thus harder to cure, than others with the same disease. Patients' ages, other diseases, history of prior treatment, health habits (smoking, for example), diet, and home environment must all be taken into account. So before comparing outcome data, health care report cards must be "risk-adjusted" for the initial conditions of patients. Although risk adjustment in medicine is far more sophisticated than controls in education for minority status or lunch eligibility, health policy experts still consider the greatest flaw in medical accountability systems to be their inability to adjust performance comparisons adequately for patient characteristics.

For example, the Health Care Financing Administration (HCFA) initiated its accountability system for cardiac surgery in 1986 with its reports on death rates of Medicare patients in 5,500 U.S. hospitals. HCFA used a complex statistical model to identify hospitals whose death rates after surgery were greater than expected, after accounting for patient characteristics. Yet the institution labeled as having the worst death rate, even after sophisticated risk-adjustment, turned out to be a hospice caring for terminally ill patients.[8]

The following year, HCFA added even more

What Really Happens in the Private Sector?

When New York City Mayor Michael Bloomberg announced a 2007 teachers' union agreement to pay cash bonuses to teachers at schools where test scores increase, he said, "In the private sector, cash incentives are proven motivators for producing results. The most successful employees work harder, and everyone else tries to figure out how they can improve as well."[1] Eli Broad, whose foundation promotes incentive pay plans for teachers, added, "Virtually every other industry compensates employees based on how well they perform.... We know from experience across other industries and sectors that linking performance and pay is a powerful incentive."[2]

These claims misrepresent how private sector firms motivate employees. Although incentive pay systems are commonplace, they are almost never based exclusively or even primarily on quantitative output measurement for professionals. Indeed, while the share of private sector workers who get performance pay has been increasing, the share of workers who get such pay based on numerical output measures has been decreasing.[3] The business management literature nowadays is filled with warnings about incentives that rely heavily on quantitative rather than qualitative measures.

Because of the ease with which most employees game purely quantitative incentives, most private sector accountability systems blend quantitative and qualitative measures, with most emphasis on the latter. This method characterizes accountability of relatively low- and high-level employees. McDonald's, for example, does not evaluate its store managers by sales volume or profitability alone. Instead, a manager and his or her supervisor establish targets for easily quantifiable measures such as sales volume and costs, but also for product quality, service, cleanliness, and personnel training, because these factors may affect long-term profitability as well as the reputation (and thus, profitability) of other outlets.[4]

Certainly, supervisory evaluation of employees is less reliable than numerical output measurements such as storewide sales (or student test scores). Supervisory evaluation may be tainted by favoritism, bias, inflation and compression (narrowing the range of evaluations to avoid penalizing or rewarding too many employees), and even kickbacks or other forms of corruption.[5] Yet the widespread management use of subjective evaluations, despite these flaws, suggests that, as one personnel management review concludes, "it is better to imperfectly measure relevant dimensions than to perfectly measure irrelevant ones."[6]

–R.R.

Endnotes for this excerpt are online at **www.aft.org/pubs-reports/american_educator/issues/spring2009/rothstein.pdf**.

patient characteristics to its statistical model. Although the agency now insisted that its model adequately adjusted for all critical variables, the ratings consistently resulted in higher adjusted mortality rates for low-income patients in urban hospitals than for affluent patients in suburban hospitals.[9] Campbell's law swung into action—when surveyed, physicians and hospitals began to admit that they were refusing to treat sicker patients.[10] Surgeons' ratings were not adversely affected by deaths of patients who had been denied surgery. Surveys of cardiologists found that most were declining to operate on patients who might benefit from surgery but were of greater risk.[11] Some hospitals, more skilled at selection, got higher ratings, while others did worse because they received a larger share of patients with more severe disease. In 1989, St. Vincent's Hospital in New York City was put on probation by the state after it placed low in the ranking of state hospitals for cardiac surgery. The following year, it ranked first in the state. St. Vincent's accomplished this feat by refusing to operate on tougher cases.[12]

How much gain in reading and math scores is necessary to offset the **goal distortion**—less art, music, physical education, science, etc.—that inevitably results from rewarding schools for score gains only in reading and math?

Attempts to hold schools accountable for math and reading test scores have corrupted education by reducing the attention paid to other important curricular goals; by creating incentives to ignore students who are either above or far below the passing point on tests; by misidentifying failing and successful schools because of test unreliability; by converting instruction into test preparation that has little lasting value; and by gaming, which borders on (or may include) illegality.

As the examples provided demonstrate, each of these corruptions has parallels in other fields, often studied by social scientists and management theorists. But education policymakers have paid little attention to this expertise.[13] Instead, state and federal governments adopted test-based accountability as the tool for improving student achievement, duplicating the worst features of flawed accountability systems in other public and private services.

Some advocates of test-based accountability in education, confronted with evidence of goal distortion or excessive test preparation, have concluded that these problems stem only from the inadequacy of teachers. As one critic argues, good teachers "can and should" integrate subject matter so that raising math and reading scores need not result in diminished attention to other curricular areas.[14] But this expectation denies the intent and power of incentives that, if successful, *should* redirect attention and resources to those outputs that are rewarded. The consistency with which professionals and their institutions respond in this fashion in all fields should persuade us that this is not a problem with the ethos of teachers, but an inevitable consequence of any narrowly quantitative incentive system.

And yet, the fact that exclusively quantitative accountability systems result in goal distortion, gaming, and corruption in a wide variety of fields is not inconsistent with a conclusion that such systems nonetheless improve average performance in the narrow goals they measure. At the very least, they may direct attention to outliers that warrant further investigation. Several analyses by economists, management experts, and sociologists have concluded that narrowly quantitative incentive schemes have, at times, somewhat improved the average performance of medical care, job training, welfare, and private sector agents. The documentation of perverse consequences does not indicate that, in any particular case, the harm outweighed the benefits of such narrow quantitative accountability. But it does raise important questions.

In education, how much gain in reading and math scores is necessary to offset the goal distortion—less art, music, physical education, science, history, character building—that inevitably results from rewarding teachers or schools for score gains only in reading and math? How much misidentification of high- or low-performing teachers or schools is tolerable in order to improve their average performance? How much curricular corruption and teaching to the test are we willing to endure when we engage in, as one frequently cited work in the business management literature puts it, "the folly of rewarding A while hoping for B"?[15]

Fortunately, no accountability at all is not the only alternative to the flawed approach of exclusive reliance on quantitative output measures. It is possible, indeed practical, to design an accountability system in education to ensure that schools and educators meet their responsibilities to deliver the broad range of outcomes that the American people demand, without relying exclusively on measures as imperfect as test scores. Such a system would be more expensive than our current regime of low-quality standardized tests, and would not give policymakers the comfortable, though false, precision that they want quantitative measures like test scores to provide.

Because Americans have broad goals for their children—from solid academics to responsible citizenship to good health—we require an equally broad accountability system, one that considers test scores, but also relies on human judgment. And, because schools cannot be solely responsible for youth development (or even for closing the achievement gap, which exists before kindergarten), this broad accountability system should include both schools and other institutions that support our children. For more on what such a system should look like, please see the next article. ☐

Endnotes for this excerpt are online at **www.aft.org/pubs-reports/american_educator/issues/spring2009/rothstein.pdf**.

Grading Education

Test-Based Accountability Can't Work, But Testing Plus Careful School Inspections Can

By Richard Rothstein, Rebecca Jacobsen, and Tamara Wilder

Noble though its intent may be, the No Child Left Behind Act—the federal law that requires virtually all students to be proficient in reading and math by 2014—is an utter failure. Many critics have denounced it, as well as similar state accountability policies based exclusively on quantitative measures of a narrow set of school outcomes. Critics have described how accountability for math and reading scores has inaccurately identified good and bad schools, narrowed the curriculum (by creating perverse incentives for schools to ignore many important purposes of schools beyond improving math and reading test scores), caused teachers to focus on some students at the expense of others, and tempted educators to substitute gamesmanship for quality instruction.

Despite widespread dissatisfaction with No Child Left Behind (NCLB), Congress has been unable to devise a reasonable alternative and so, for now, NCLB remains on the books. There have been many proposals for tinkering with the law's provisions—extending the deadline for reaching proficiency, measuring progress by the change in scores of the same group of students from one year to the next (instead of comparing scores of this year's students with scores of those in the same grade in the previous year), adding a few other requirements (like graduation rates or parent satisfaction) to the accountability regime, or standardizing the definitions of proficiency among the states. Yet none of these proposals commands sufficient support because none addresses NCLB's most fundamental problem: although tests, properly interpreted, can contribute some important information about school quality, testing alone is a poor way to measure whether schools, or their students, perform adequately.

Perhaps the most important reason why NCLB, and similar testing systems in the states, got accountability so wrong is that we've wanted to do accountability on the cheap. Standardized tests that assess only low-level skills and that can be scored electronically cost very little to administer—although their hidden costs are enormous in the lost opportunities to develop young people's broader knowledge, traits, and skills.

The fact is, schools have an important but not exclusive influence on student achievement; the gap in performance between schools with advantaged children and schools with disadvantaged children is due in large part to differences in the social and economic conditions from which the children come.[1] For this reason, schools can best improve youth outcomes if they are part of an integrated system of youth development and family support services that also includes, at a minimum, high-quality early childhood care, health services, and after-school and summer programs. An accountability system should be designed to ensure that *all* public institutions make appropriate contributions to youth development. When schools are integrated with supporting services, they can substantially narrow the achievement gap between disadvantaged and middle-class children.

A successful accountability system, such as the one we will propose in this article (and which we more fully explain in our book, *Grading Education: Getting Accountability Right*), will initially be more expensive. Our proposal calls for both a sophisticated national assessment of a broad range of outcomes and a corps of professional inspectors in each state who devote the time necessary to determine if schools and other institutions of youth development—early childhood programs, and health and social services clinics, for example—are following practices likely to lead to adult success. But while such accountability will be expensive, it is not prohibitively so. Our rough estimate indicates that such accountability could cost up to 1 percent of what we now spend on elementary and secondary education. If we want to do accountability right, and we should, this level of spending is worthwhile.

In the long run, trustworthy accountability is cost effective. Because narrow test-based accountability can neither accurately identify nor guide schools that need to improve, we now waste

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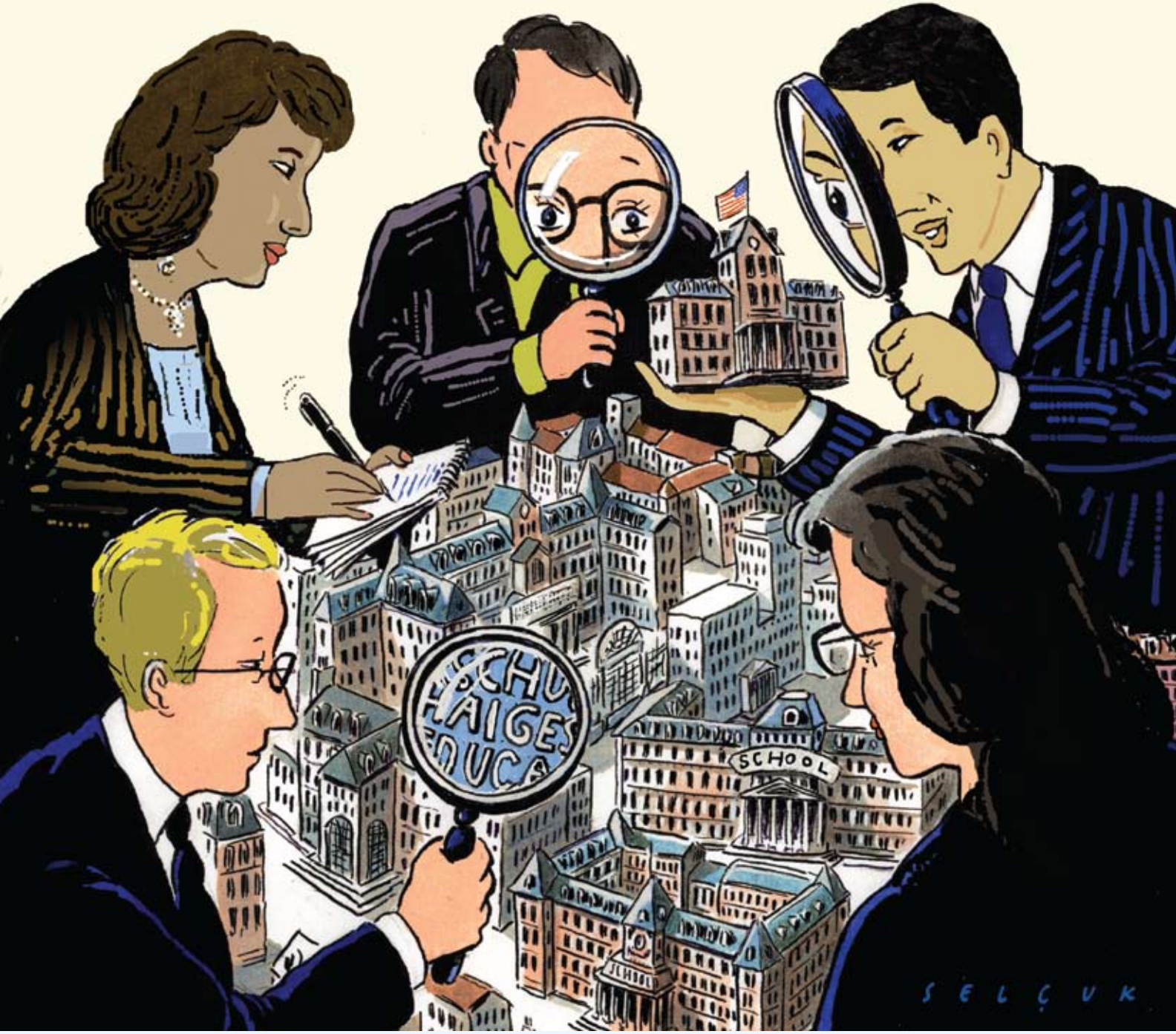


billions of dollars by continuing to operate low-quality schools. And we waste billions by forcing good schools to abandon high-quality programs to comply with the government's test obsession. We cannot know how much money could be saved by more intelligent accountability, but it is probably considerable.

Of course, no accountability system can be successful without first defining the outcomes that schools and other institutions of youth development should achieve. Before we put forth our vision for a new approach to accountability, let's take a moment to compare the goals that Americans have long valued with the goals that we are currently pursuing.

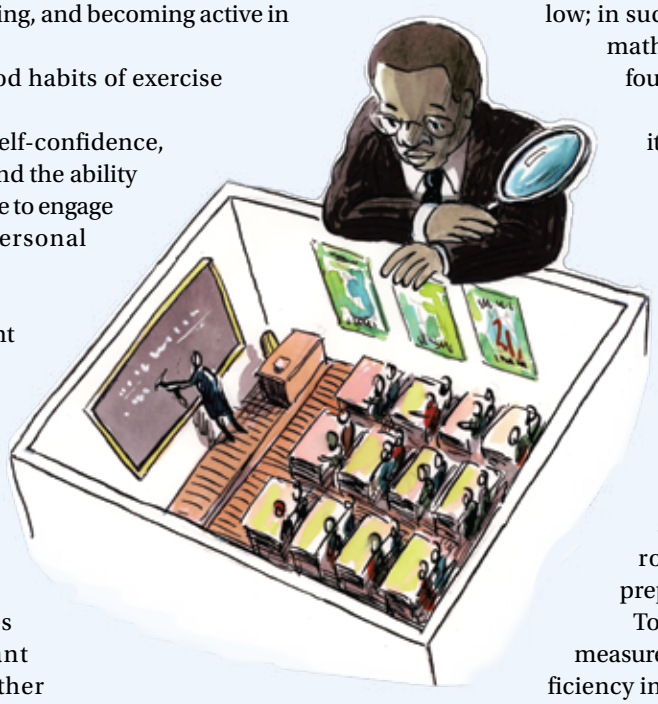
First Things First: Accountability for What?

From our nation's beginnings, Americans have mostly embraced a balanced curriculum to fulfill public education's mission. Looking back over 250 years, we reviewed a small sample of the many statements produced by policymakers and educators to define the range of knowledge, skills, and character traits that schools ought to develop in our youth. We were struck by how similar the goals of public education have remained during America's history. Although some differences of emphasis have emerged during different eras, our national leaders—from Benjamin Franklin to Horace Mann to various university presidents and school superintendents—seem consistently to have wanted public education to produce satisfactory outcomes in the following eight broad categories:

1. *Basic academic knowledge and skills*: basic skills in reading, writing, and math, and knowledge of science and history.
2. *Critical thinking and problem solving*: the ability to analyze information, apply ideas to new situations, and (more

recently) develop knowledge using computers.

3. *Appreciation of the arts and literature*: participation in and appreciation of musical, visual, and performing arts as well as a love of literature.
4. *Preparation for skilled employment*: workplace qualifications for students not pursuing college education.
5. *Social skills and work ethic*: communication skills, personal responsibility, and the ability to get along with others from varied backgrounds.
6. *Citizenship and community responsibility*: public ethics; knowledge of how government works; and participation by voting, volunteering, and becoming active in community life.
7. *Physical health*: good habits of exercise and nutrition.
8. *Emotional health*: self-confidence, respect for others, and the ability to resist peer pressure to engage in irresponsible personal behavior.



Having examined recent surveys of the public's goals for education and having conducted our own poll (in 2005) of the general public, school board members, and state legislators, we are fairly confident that these are, indeed, the outcomes that Americans still want from our schools and other youth institutions.

Unfortunately, today's obsession with reading and math scores means that almost all of these eight goals are ignored. Several surveys of school and district officials, principals, and teachers confirm that the public school curriculum has been dangerously narrowed. But the narrowing did not begin with No Child Left Behind; there was evidence of it throughout the last couple of decades as math and reading tests steadily gained importance. In a 1994–95 survey of Maryland teachers, two-thirds said that they had reduced the amount of time they spent on instruction in nontested subjects, especially art, music, and physical education.[2] In the 1990s, similar curricular shifts were also common in Texas (which, being George W. Bush's home state, provided the model for NCLB). In that state, and especially in schools serving disadvantaged minority students, teachers of art, history, and science were required to put their curricula aside to drill students in the basic math and reading skills that were tested by the state exam.[3]

A survey of school principals in North Carolina, after the state implemented a test-based accountability system in 1999, found that over 70 percent had redirected instruction from other subjects and from character development to reading, math, and writing, and that this response was greatest in the lowest-scoring schools.[4] A 2003 survey of school principals in Illinois, Maryland, New Mexico, and New York found that those in high-minority schools were more likely to have reduced time for history, civics, geography, the arts, and foreign languages to devote more time to math and reading.[5]

The most comprehensive investigations of test-driven curricular shifts have been conducted by the Center on Education Policy, which surveyed 349 representative school districts during the 2006–07 school year. It found that accountability does work: 62 percent of these districts had increased time devoted to reading and math. The increases were greatest in urban districts sanctioned under NCLB because their test scores were too low; in such districts, the increase in reading and math instruction totaled an average of over four hours a week.[6]

This is just what test-based accountability systems intend to accomplish. Students whose reading and math performance was lowest were getting a lot more instruction in these subjects. But increased time for test preparation in reading and math comes at the expense of time for something else. These districts cut an average of an hour or more per week from instruction in social studies, science, art and music, physical education, and recess. Most districts facing sanctions cut time from several of these subject areas to make room for more reading and math test preparation.

To make matters worse, even such drastic measures are unlikely to bring all students to proficiency in reading and mathematics. Inadequate schools are only one reason disadvantaged children perform poorly. They come to school under stress from high-crime neighborhoods and economically insecure households. Their low-cost daycare tends to park them before televisions, rather than provide opportunities for developmentally appropriate play. They switch schools more often because of inadequate housing and rents rising faster than parents' wages. They have greater health problems, some (like lead poisoning or iron-deficiency anemia) directly depressing cognitive ability, and some (like asthma and vision difficulties) causing more absenteeism or inattentiveness. Their households include fewer college-educated adults to provide more sophisticated intellectual environments, and their parents are less likely to expect academic success.[7] Nearly 15 percent of the black-white test-score gap can be traced to differences in housing mobility, and 25 percent to differences in child and maternal health.[8]

Yet contemporary test-based accountability policies expect that school improvement alone will raise all children to high levels of achievement, poised for college and professional success. Teachers are expected to repeat the mantra "all children can learn," a truth carrying the false implication that the level to which children learn has nothing to do with their starting points or with the out-of-school supports they receive. Policymakers and school administrators warn teachers that any mention of

children's socioeconomic disadvantages only "makes excuses" for teachers' own poor performance.

Of course, there are better and worse schools, and better and worse teachers. And of course, some disadvantaged children excel more than others. But our current federal and state test-based accountability policies have turned these obvious truths into the fantasy that teachers can wipe out socioeconomic differences among children simply by trying harder.

It is surprising that so many education policymakers have been seduced into thinking that simple quantitative measures like test scores can be used to hold schools accountable for achieving complex educational outcomes. After all, similar accountability systems have been attempted, and have been found lacking, in other sectors, both private and public, many times before. The corruptions and distortions resulting from test-based accountability are no different from those that have been widely reported in the business world, as well as in fields like health care, welfare, job training, law enforcement, and other government services. (For a quick review of the problems caused by quantitative measures in law enforcement, higher education, health care, and other sectors, see "What's Wrong with Accountability by the Numbers?" on page 20.)

Teachers are expected to repeat the mantra "all children can learn," a truth carrying the **false implication** that the level to which children learn has nothing to do with the out-of-school supports they receive.

The solution, as we briefly stated in the introduction, is not to abandon testing, but to supplement it with periodic inspections of both schools and other organizations that support our youth. Appreciating the arts, developing a strong work ethic, accepting responsibility as a citizen—these goals are as important as our academic goals, and our accountability system should treat them as such. Simply put, we must devise ways of holding schools and other youth development institutions accountable for achieving all eight of the goals that Americans have long valued. And, instead of setting fanciful targets that set up our institutions to fail, we must devise realistic targets that inspire continuous improvement.

Test Prep or True Learning: What's Behind Those Test Scores?

Other nations have also struggled with accountability for public education. Yet while Americans have relied upon test scores alone—and even worse, proficiency cut scores—to judge school quality, others have supplemented standardized testing with school inspection systems that attempt to assess whether students are developing a balanced set of cognitive and noncognitive knowledge and skills. While England, Scotland, Wales, Northern Ireland, the Netherlands, the Czech Republic, Belgium, Portugal, France, and New Zealand[9] all have some form of inspection system, Her Majesty's Inspectors in England offer us a particularly intriguing model because they hold schools and other social welfare institutions accountable for education and youth development.

Because the English inspection system continually undergoes revision, the following describes the English inspectorate as it existed until 2005, when a major revision commenced.

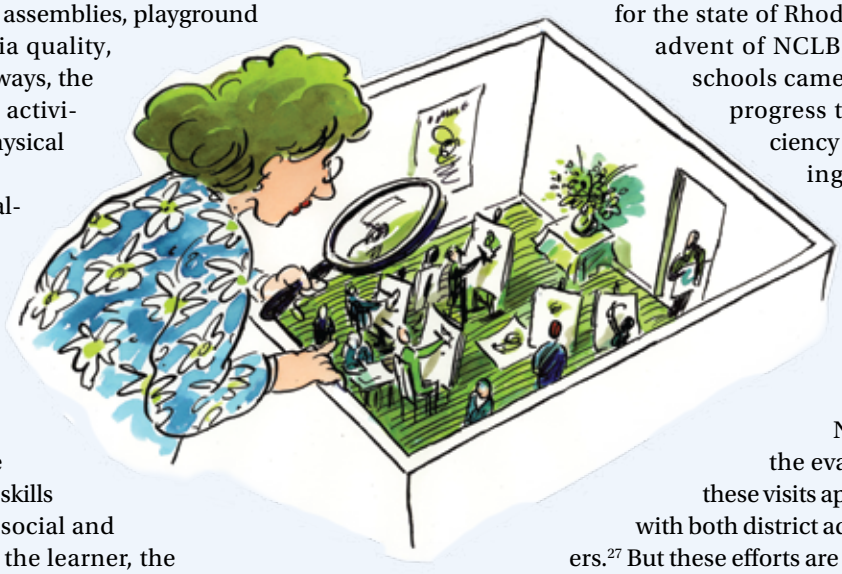
Accountability is overseen by an independent government department, the Office for Standards in Education (Ofsted). In the early part of this decade it had a corps of about 6,000 inspectors who visited schools and wrote reports on their quality. Most inspectors, usually retired school principals or teachers, were directly employed by a dozen or so firms with which Ofsted contracted to conduct the inspections. An elite group, about 200 of "Her Majesty's Inspectors" (HMIs), were employed directly by Ofsted and oversaw the entire process. Ofsted trained the contracted inspectors, required them to attend annual retrainings, and certified them prior to employment. Ofsted also assured the reliability of inspectors' judgments by having several inspectors judge the same educational activity and then comparing their ratings. Ofsted monitored the inspectors' work and removed those whose quality was inadequate—for example, those who never found lessons to be unsatisfactory.[10]

To ensure quality, the leader of each school inspection team underwent a higher level of training than the other team members, and an HMI sometimes also participated in each larger team of contracted inspectors. Ofsted also required each team to include one lay inspector, often a retiree from another profession, to give the inspections greater credibility with the public. Each inspection resulted in a report published on the Internet within three weeks; the report was mailed to every parent, with photocopies also made available to the public.[11] In the case of schools that persistently failed to pass inspection, local governments assumed control and, in the most serious cases, closed them.[12]

Until 2005, a typical full-time English inspector may have visited from 15 to 30 schools each year, and part-time inspectors (usually retired principals) may have visited seven or eight.[13] Because of this experience and their training, English inspectors were highly respected by teachers and principals, who were thus more likely to take inspectors' advice seriously and consider inspectors' evaluations legitimate. Ofsted inspectors were required to spend most of their time observing classroom teaching, interviewing students about their understanding, and examining random samples of student work.[14] Ofsted inspectors decided which students to interview and which classrooms to visit at any particular time.[15] Although they spent relatively little time meeting with administrators, Ofsted inspectors did require principals to accompany them on some classroom observations,

after which the inspectors asked the principals for their own evaluations of the lessons. In this way, the inspectors were able to make judgments (which became part of their reports) about the competence with which the principals supervised instruction.[16]

Ofsted's contracted inspectors observed every teacher in each school, evaluating pupil achievement in all academic as well as in noncognitive areas.[17] Ofsted inspectors rated everything they observed, including teaching skill, student participation, achievement, and academic progress, on a seven-point scale, with supporting paragraphs justifying the ratings. They also wrote reports on student assemblies, playground practice, school cafeteria quality, student behavior in hallways, the range of extracurricular activities, and the quality of physical facilities.[18]



Ofsted reports also evaluated how well schools teach not only academic knowledge and skills but personal development: "the extent to which learners enjoy their work, the acquisition of workplace skills, the development of skills which contribute to the social and economic well-being of the learner, the emotional development of learners, the behaviour of learners, the attendance of learners, the extent to which learners adopt safe practices and a healthy lifestyle, learners' spiritual, moral, social, and cultural development, [and] whether learners make a positive contribution to the community."[19]

Inspections used to be every six years, but then Ofsted changed them to every three years[20] and became more flexible about the frequency of inspections. As the system developed, schools with a history of very high ratings were visited less frequently, with smaller teams, and without every classroom and teacher visited. Schools with a history of poor ratings were visited more often and more intensively.[21]

In recent years, Ofsted added on inspections of early childhood care providers and vocational education programs, and evaluations of how well schools coordinate their own programs with such services. When possible, Ofsted conducts inspections of schools and other child and welfare services in the same community simultaneously.[22]

Ofsted has made no effort to produce fine rankings of schools by which the public could judge each school in comparison with all others. Rather, Ofsted has reported which of three categories schools fall into: those that pass inspection, those in need of fairly modest improvements, and those requiring serious intervention to correct deficiencies.

In addition to regular school inspections, the English system has also included special inspections to evaluate particular problems or curricular areas—for example, music instruction, physical education, the underachievement of minority students, or disparate punishments meted out to them.[23] For these, HMIs visited only a representative group of schools. There were enough of these special inspections, however, that schools were likely to have experienced an inspection for some purpose more frequently than was required by the regular schedule.[24]

England's inspection system may not be perfect—and even if it were, we could not simply adopt it in this country. But it does offer a compelling alternative to our test-based accountability. In the United States, there have been attempts to create a similar inspection system. In the late 1990s, a student of the English inspection system designed a school visit system for the state of Rhode Island.[25] But with the advent of NCLB, it lost importance as schools came to be judged solely on progress toward universal proficiency levels in math and reading. The Chicago school system hired a former English HMI to design a school review system for the district.[26] New York City hired an Ofsted contractor to visit and evaluate all New York City schools; the evaluations resulting from these visits apparently have credibility with both district administrators and teachers.[27] But these efforts are in conflict with contemporary state and federal accountability standards, which make schools almost exclusively accountable for math and reading test scores.

Such attempts to create better accountability systems shouldn't be allowed to collapse under the weight of our obsession with reading and math scores. To fulfill our desire to hold American schools and their supporting public institutions accountable, it makes sense to design a system that draws upon the best elements of standardized testing and inspection systems.

A Better Model: What Would It Look Like?

It is not our intent to present a fully developed accountability proposal; that is a task for policymakers, public officials, and citizens. We only hope to provoke discussion that will help move American policy beyond an exclusive reliance on standardized testing of basic skills.[28]

To begin, we assume that accountability should be a state, not federal, responsibility. Not only do we have a constitutional tradition of state control of education, but the failure of No Child Left Behind has made it apparent that in this large country, the U.S. Congress and U.S. Department of Education are too distant to micromanage school performance.

There are, however, two important tasks for the federal government: (1) to ensure that each state has the fiscal capacity to provide adequate education and other youth services, and (2) to expand the National Assessment of Educational Progress (NAEP) to provide state policymakers with information on the achieve-

ment of their states' young adults and 17-, 13-, and 9-year-olds in the eight broad areas we presented earlier. These two tasks are prerequisite to an accountability system that ensures we, as a nation, are raising the performance of disadvantaged children—and of middle-class children as well. We'll briefly discuss each.

For the last 30 years, reformers concerned with the inadequate resources devoted to the education of disadvantaged children have directed attention almost entirely to intrastate equalization—trying to see that districts serving poor students have as much if not more money to spend as districts serving middle-class children in the same state. These reformers have largely ignored the vast resource inequalities that exist between states. Yet about two-thirds of nationwide spending inequality is between states and only one-third is within them.[29] Efforts to redistribute education funds within states cannot address the most serious fiscal inequalities. Consider one of the most extreme cases, Mississippi: no matter how deep the commitment of its leaders may be to improving achievement, its tax base is too small to raise revenues in the way that wealthier states can, while its challenges—the number of its low-income minority children relative to the size of its population—are much greater than those of many states that are considered more progressive. In general, fewer dollars are spent on the education of the wealthiest children in Mississippi than on the poorest children in New York or New Jersey.

In general, fewer dollars are spent on the education of the wealthiest children in Mississippi than on the poorest children in New York. Yet **federal aid exacerbates inequality** in states' fiscal capacities.

Yet federal aid exacerbates inequality in states' fiscal capacities. Federal school aid—to districts serving poor children—is proportional to states' own spending.[30] New Jersey, which needs less aid, gets more aid per poor pupil than Mississippi, which needs more.

It is politically tough to fix this, because sensible redistribution, with aid given to states in proportion to need and in inverse proportion to capacity, must take tax revenues from states like New Jersey (whose representatives tend to favor federal spending) and direct them to states like Mississippi (whose representatives tend to oppose it).[31] Nonetheless, it is unreasonable to expect states that lack sufficient resources to hold their schools and other institutions of youth development accountable for adequate and equitable performance in each of the eight goal areas.

The second critical task for the federal government should be gathering valid and reliable information on the relative performance of students in the different states. One helpful aspect of No Child Left Behind was the requirement that every state participate in NAEP reading and math assessments for the fourth and eighth grades every two years. Because these are the only assessments administered in common to representative samples of students in all states, they provide a way to compare how each state ensures that its elementary school children gain these two academic skills. To spur effective state-level accountability, the NAEP state-level assessment should:

- *Assess representative samples of students at the state level and on a regular schedule, not only in math and reading, but in other academic subject areas*—science, history, other social studies, writing, foreign language—as well as in the arts, citizenship, social skills, and health behavior. These assessments should include paper-and-pencil test items, survey questions, and performance observations.

- *Gather better demographic data.* NAEP has collected systematic demographic data from its samples of test takers only for race, Hispanic ethnicity, and free or reduced-price lunch eligibility. The range of characteristics within these categories is wide. For example, first- and second-generation Hispanic immigrant children are in different circumstances from those who are third generation and beyond, and students eligible for free meals come from families that may be considerably poorer than those in the reduced-price program. Since 2000, NAEP has collected data on maternal educational attainment, and it would be relatively easy to collect a few other critical characteristics—most notably family structure (e.g., single parent) and the mother's country of birth. Such data could be collected by schools upon a child's initial enrollment and become part of a student's permanent record. Adding these demographic characteristics to state-level NAEP may require minimal expansion of sample sizes, but the payoff to this relatively modest expansion would be substantial, and it would facilitate the ability of state leaders to draw valid conclusions about their policy needs.

- *Report NAEP scores on scales, not achievement levels.* Reports of average scale scores at different points in the distribution, such as quartiles, could be published in language easily understood by the public. State policymakers should then be interested in how the average scale scores of students in each quartile of each relevant demographic subgroup compare with scores of similar students in other states. Successful progress should then be judged by whether such average scores in each achievement quartile make progress toward the scores of comparable students in better-performing states. Note that this approach does away with today's ill-considered achievement levels (which are based on fanciful definitions of "proficiency" that vary wildly from state to state). Since there would be no all-or-nothing cut score, there would then be no "bubble" of students just below the cut score, and teachers and schools would have no incentive to concentrate instruction only on these students. All students would be expected to make progress.

- *Use age-level, not grade-level, sampling.* Age-level assessment is the only way to get an accurate reading of the relative effectiveness of state education and youth policies. With the current grade-level assessment, one state's eighth-grade scores may be higher than another's only because more low-performing seventh graders were held back, not because its ultimate outcomes are superior. If 13-year-olds were assessed regardless of grade, this distortion would be avoided. With age-level sampling, results from states with different promotion and school-age policies could be compared accurately.*

- *Supplement in-school samples with out-of-school samples.* The best evidence of the quality of our education and youth development policies is the performance of 17-year-olds, for whom states are completing their normal institutional responsibility, and of young adults, to see whether knowledge and skills developed earlier are being retained. To get representative samples of 17-year-olds and young adults, assessments should include an out-of-school household survey that covers each of the eight broad goals.

Dramatic expansion of NAEP in this fashion need not have the harmful effects that standardized testing under contemporary state and federal accountability policies has produced. Incentives for teachers to "teach to the test" are avoided because NAEP is a sampled assessment, with any one particular school rarely chosen, only a few students in the selected schools assessed, and those students given only portions of a complete exam. There are no consequences for students or schools who do well or poorly, because results are generated only at the state level; nobody knows how particular students or schools performed. Because an expanded NAEP should assess the full range of cognitive and noncognitive knowledge and skills encompassed by the eight broad goals of education, NAEP can give state policymakers and educators no incentives to ignore untested curricular areas.

With this federal support, states can design accountability systems that include academic testing in core subject areas and in those nonacademic fields where standardization is possible, such as health awareness and physical fitness. State accountability systems can supplement such testing and provide detailed school-level data by use of inspection procedures that ensure that adequate performance in each of the eight goal areas is achieved, and that schools and other institutions of youth development implement strategies likely to improve that performance.

State-Level Accountability That Encourages School Improvement

An expanded NAEP can tell governors, legislators, and citizens the extent to which their states are doing an adequate job of generating student success in each of the eight goal areas. Then, citizens and state policymakers can use this information to guide the refinement of state policy. They will want to ensure that particular schools and school districts, children's health care institutions, early childhood and preschool programs, parental support and education programs, after-school and summer programs, and community redevelopment agencies are contributing to, not impeding, the achievement of such success. This requires ways for state government to hold these school districts, schools, and other supporting institutions accountable.

A **full accountability system** requires judgment about whether schools, along with other institutions of youth development, are likely to generate **balanced outcomes** across the eight goals.

The following proposals sound like a great deal of testing, but keep in mind that it is not necessary to test each subject in each grade level each year. Decisions about what to test, in which grade, and how often should be made at the state level, but a great deal of useful information can be gathered without more tests than students currently take. With that in mind, we propose that states:

- *Cover all eight goals of public education* to avoid the goal distortion that results from accountability for only a few basic skills. Many standardized tests in subjects other than math and reading now exist, but few include constructed-response items, in which students are not given multiple choices but must work out factual or prose answers on their own. Certainly, higher-quality academic tests in history, writing, the sciences, and other academic areas should be deployed, as should standardized assessment instruments, where possible, in nonacademic areas. For example, instruments exist that can assess a student's upper-body strength and, combined with data on the student's weight and height, inform the evaluation of a school's physical education program.[32]

- *Use standardized test scores very cautiously to judge schools, and only in combination with other data.* If states' tests are improved, as they should be, to include higher-quality items that cannot be machine scored, the precision with which the tests can be scored will decline. Many schools are too small to generate reliable results for particular age groups even on

*Age-level sampling in NAEP need not mean that states' own tests used for school-level accountability must be standardized for age instead of grade level. Because states, if they choose, can standardize school entry ages and social promotion policies, grade-level test results are less subject to misinterpretation if confined to particular states. States have an interest in using tests to determine if mandated grade-level curricula are being implemented successfully. Provided that NAEP assesses samples of students of the same age, not grade, we will have the data we need to understand if the combination of age-to-grade policies in some states are more effective than they are elsewhere.

existing low-level tests of basic skills. With more complex items included, reliability will decline further.

- *Supplement information from standardized tests with expert evaluation of student work.* Even the most sophisticated test questions are not fully adequate to reveal students' abilities. NAEP exams include a large number of constructed-response items. But even these questions are no substitute for expert examination of drafts and redrafts of student essays for evidence of how students respond to critiques of their initial efforts and how they develop themes that are longer than those of a brief constructed response on an exam.

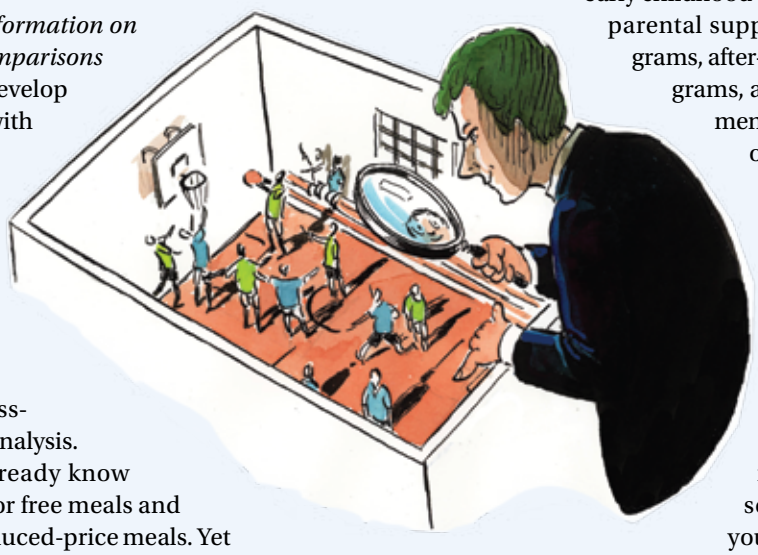
- *Collect richer background information on students to make test score comparisons meaningful.* As more states develop good student data systems, with unique student identification numbers and maintenance of cumulative records for each student in secure school databases for the student's entire school career, it will become easier to attach richer background information to student assessment results for purposes of analysis. As one example, schools already know which students are eligible for free meals and which are eligible only for reduced-price meals. Yet in their school "report cards," many (but not all) states and school districts combine these categories, rendering them less useful for understanding and comparing student performance. It would be a simple matter for elementary schools to record, upon a student's initial enrollment, not only the student's subsidized lunch eligibility but also the educational attainment of the mother (or primary caretaker), whether the mother was born in the U.S., and the number of parents or other responsible adults in the student's household.

- *Use NAEP to set realistic goals that inspire continuous improvement.* Goals are valuable, but they should always be feasible, not fanciful. Once NAEP has been expanded, states can establish goals based on the performance of students with similar characteristics in other states. Such goals should be established not only for average performance but also for NAEP performance at the higher and lower ends of the student achievement distribution. If all states regularly established and revised such realistic goals, it would result in a permanent process of continuous improvement.

But test scores and evaluations of student work, even for larger schools, and even when connected to more nuanced student background characteristics, are of only partial value. A full accountability system requires evaluation of student performance in areas more difficult to standardize (for example, cooperative behavior), and judgment about whether a school's curriculum and instruction, along with a community's other institutions of youth development, are likely to generate balanced and adequate outcomes across the eight goals.

To supplement test scores and evaluations of students' written work, states wanting to hold school districts, schools, and supporting institutions accountable require an inspection system. Each state should:

- *Conduct mandatory inspections in each school and in each related community institution* (children's health care services, early childhood and preschool programs, parental support and education programs, after-school and summer programs, and community development agencies) approximately once every three years. Where feasible, accreditation of all these institutions in a particular community should be coordinated. Once the system is firmly established, inspections might be conducted less frequently in communities and schools with satisfactory youth outcomes, and more frequently in communities and schools where outcomes are not satisfactory.



- *Design school inspections to determine primarily whether students are achieving adequate outcomes in all eight goals,* not whether schools are meeting the idiosyncratic goals of their faculties and administrations. Inspection teams should compare schools' performance to higher-performing schools with similar demographic characteristics. Such a standard necessarily will lead to continual improvement by all schools.

- *Make most inspectors professional evaluators,* not volunteers, trained to ensure consistency of judgment, and certified as competent by state (or regional) inspection agencies.

- *Include members of the public, representatives of the business community, or designees of elected officials on inspection teams.* Not only would such participation give inspection greater public credibility, but these members, with their varied backgrounds and perspectives, may detect aspects of school quality requiring improvement that may not be apparent to professional educators.

- *Conduct inspections with little or no advance notice, and give inspectors access to all classrooms for random observation.* Likewise, inspectors should choose random students to invite to interview, and whose work to review.

- *Have teams include in their reports an evaluation and interpretation of schools' standardized test scores, but supplement this* by examining student work, listening to student performances, observing student behavior, and interviewing students to gain insight into their knowledge and skills.

- *Require inspectors to make clear recommendations* about how curriculum, instruction, or other school practices should be improved if they find a school's performance to be inadequate in one or more goal areas. Although schools may choose not to follow the specific advice of inspectors, subsequent inspections (more frequent than once every three years in cases where performance is inadequate) should determine whether performance has improved and, if not, why schools did not follow recommendations for improvement. Inspections of other community institutions should employ similar procedures.

- *Make inspection reports public*, and in a timely fashion. Reports should include responses by administrators or teachers to inspectors' criticisms.

- *Establish consequences.* States should assume direct control of schools and other public institutions of youth development when improvement does not follow repeated inspection reports that indicate severe problems.

The accountability system outlined here would not be cheap. But neither would it be so expensive that this proposal is unrealistic, as the following "back-of-the-envelope" estimate shows. At present, the federal government spends about $40 million annually to administer a state-level NAEP exam in math or reading in grades 4, 8, and 12. Assessing 9-, 13-, and 17-year-olds instead could add a little, but not much, to the cost (because, for example, a few 13-year-olds might be found in high schools, not middle schools). Design costs (including substituting new items as old items are rotated out) also add relatively little cost. Expanding samples so that state-level information can be disaggregated into finer demographic subgroups also adds relatively little cost. Adding additional academic and nonacademic subjects (writing, history, other social studies, science, foreign language, health knowledge, physical fitness, and understanding of the arts and vocations) at the state level need not duplicate the full cost for each subject if only paper-and-pencil items are used, because NAEP could use many of the same schools that it samples for math and reading. There would, however, be additional costs for preparing test booklets that included sophisticated multicolor maps or art reproductions. Adding performance and other nontraditional items that can easily be standardized (for example, tests of upper-body strength or identification of musical themes) would incur substantial additional expense. As a very rough estimate, expanding regular state-level NAEP into all eight goals and into all subject areas within the academic categories, and administering such assessments every three years, with appropriate subgroup reporting, might cost a total of $500 million annually.

Supplementing these in-school assessments with a NAEP for out-of-school 17-year-olds and young adults, requiring a household survey conducted once every three years, might cost as much as an additional $20 million annually.

The **total cost** of the accountability system we have outlined here would be no more than **1 percent** of total elementary and secondary public school spending in the U.S.

In England, when inspections in each school took place approximately every six years, the school inspection system cost about one-quarter of 1 percent of total elementary and secondary school spending. If we assume a similar ratio for a system in the U.S., with teams visiting schools approximately every three years, the annual cost would be about $2.5 billion, or one-half of 1 percent of current federal, state, and local spending on elementary and secondary education. Additional costs would be incurred for inspecting other institutions of youth development.

Even with the additional costs of an expanded in-school state NAEP, and of a young adult and 17-year-old out-of-school state NAEP, the total cost of the accountability system we have outlined here would still be no more than 1 percent of total elementary and secondary public school spending in the U.S. This is not an unreasonable price for an accountability system that measures whether schools in every state, in coordination with other institutions of youth development, are preparing young adults to have adequate academic knowledge and skills, appreciation of the arts and literature, preparation for skilled work, social skills and work ethic, citizenship and community responsibility, physical health, and emotional health. If this system succeeded in correcting even some of the unproductive practices in schools and other institutions, the gains in efficiency would more than justify this expenditure. When accountability funds are spent correctly, they eliminate waste and save funds.

But saving money, probable though that might be in the long run, is not the primary purpose of an accountability system. If we truly want to hold institutions accountable for fulfilling the missions to which they have been assigned by the nation, and if we are determined to reverse the corruptions we have visited on schools by narrow test-based accountability policies, we should willingly entertain a system of accountability that might require higher expenditures in the short run.

No Child Left Behind has given accountability a bad name. An alternative program along the lines suggested here could redeem accountability's reputation. And it could give the citizens of this nation a better means to fulfill our responsibilities to provide for our youth and the nation's future. ☐

Endnotes for this excerpt are online at **www.aft.org/pubs-reports/american_educator/issues/spring2009/rothstein.pdf**.

Purposeful, Playful Pre-K

Building on Children's Natural Proclivity to Learn Language, Literacy, Mathematics, and Science

By Tanya S. Wright and Susan B. Neuman

It's well known that early childhood is a crucial time for cognitive development.[1] Less well known is that very young children are ready—and excited—to develop skill and understanding in language and literacy, mathematics, and science. According to the National Research Council, "these appear to be 'privileged domains'—that is, domains in which children have a natural proclivity to learn, experiment, and explore."[2] Prekindergarten (pre-K) learning experiences in these domains can help build the skills, knowledge, and attitudes that prepare young children for future academic success.* This is particularly true for children growing up in poverty—many of whom lag far behind their middle-class peers in key academic areas by the time they enter kindergarten.[3] In fact, high-quality prekindergarten programs can help prevent this gap from opening in the first place.

Young children are eager to understand more about the world. They actively strive to build knowledge and to develop language to communicate about what they learn. They develop theories about how the world works, learn to solve problems, and ask questions in a constant quest for information. And, when provided with supportive and stimulating environments, they eagerly engage in language learning, literacy practices, math play, and science exploration.[4]

So, what does a supportive and stimulating pre-K look like? There is now a wealth of research—from fields as diverse as education, cognitive psychology, neuroscience, and sociology—to help us answer that question. According to the research literature, "structural" factors—such as child-to-teacher ratios and

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*This is not to say that we believe that these subjects should be the exclusive focus of a quality pre-K curriculum. History and the social sciences, music, arts and crafts, movement, and foreign languages all have a place in a rich, well-rounded curriculum.

teachers' education levels—are important.[5] In terms of cognitive growth, however, "process" factors—the daily human interactions and activities that have the potential to enhance children's cognitive, physical, and social-emotional development—appear to be more central. Of particular importance is the quality of instruction, which appears to have a vital, lasting effect on building children's cognitive and social skills through the elementary school years.[6]

Much is known about effective methods for teaching content to very young children. Not surprisingly, these approaches differ substantially from the teaching methods commonly used with older children. In pre-K, children should be taught foundational knowledge through developmentally appropriate instructional techniques, such as read-alouds, discussions, songs, games, projects, and other active learning opportunities.[7] In addition, both free play and "structured" play (where teachers purposefully design play experiences to support specific learning goals) are particularly important for this age group.[8]

In this article, we'll summarize the research on instructional practices for each of the "privileged domains." For more information on creating a supportive and stimulating pre-K environment—including information on high-quality curricula, tips for English language learners, and key accomplishments for pre-K students—please see the report from which this article is drawn, *Preschool Curriculum: What's In It for Children and Teachers* (available at **www.ashankerinst.org**).

The central thesis of this work is that the effectiveness of today's preschool programs could be significantly improved if they were aligned with what research has demonstrated about how children learn in the academic disciplines of language, literacy, mathematics, and science. So let's dive in, taking each domain in turn.

I. Oral Language

Oral language is arguably the most crucial area of academic focus during the pre-K years. Oral language is the primary means by which children gain knowledge about the world, and it is the vital foundation for children's literacy development.

By the time children arrive in pre-K, there are vast differences in their oral language skills. One study found that, on average, by age 3 children who grew up in poverty had been exposed to half as many words as their middle-class peers and their vocabularies were about half as big. This vocabulary gap remained years later when the children were in third grade.[9] Limited oral language puts children growing up in poverty at a disadvantage when learning to read and comprehend texts. In contrast, children with large vocabularies and a relatively broad range of knowledge are in a better position to comprehend, learn from, and enjoy the books they read, contributing to successful learning experiences. The relationship between pre-K oral language and children's literacy development, as well as the social class differences in oral language that are already visible at the beginning of pre-K, make it imperative for pre-K teachers to emphasize instruction in oral language in their classrooms.

Instructional Practices for Oral language

A Language-Rich Classroom

When children are exposed to adults who talk with them regularly about a broad variety of subjects, they become better at speaking and comprehending. Children gain the words they need to represent and communicate their growing knowledge about the world, and they apply what they know to learning even more new words and concepts.

The quantity and quality of these language interactions with adults and other children matter for children's oral language development. Unfortunately, talk is often lacking in pre-K classrooms. A recent study found that children spent almost 60 percent of their time in pre-K not in conversation at all.[10] These conditions are severely detrimental for children's language and literacy development—especially for those children who are unlikely to be exposed to a language-rich learning environment outside of school. Teachers should make every effort to ensure that children are engaging in meaningful conversations and language use throughout the day.

To create a language-rich classroom, pre-K teachers should:[11]

- Engage children in extended conversations.
- Encourage children to tell and retell stories and describe events.

- Discuss a wide range of topics.
- Model use of new and unusual words.
- Discuss word meanings.
- Ask open-ended questions.
- Give explicit guidance on vocabulary, syntax, and pronunciation.
- Challenge children to justify their thinking.
- Focus on the expression of ideas.

Shared Reading of Challenging Books

Reading aloud to children is one of the best ways to facilitate oral language and vocabulary development. Children need to be exposed to a broad selection of texts, but they also need to experience repeated readings of books so that they have multiple opportunities to learn new language. Thematic units, where several books on the same topic or theme are read aloud over time, can also help deepen and broaden children's understanding of new words and concepts—allowing them to "get" the ideas and vocabulary in slightly different contexts.

Books expose children to several types of language that are foundational for academic success:

- Decontextualized language—language that must be especially precise because the reader does not have the advantage of being in the same physical location as the author.
- Sophisticated vocabulary and new concepts—interesting new words and ideas. Informational or nonfiction picture books are often underutilized in pre-K classrooms, but they are very useful for introducing interesting new information, ideas, and language to children.
- Book language—language that is specific to written text, including phrases such as "happily every after" or "said the boy" that are not used in everyday speech. Children need a firm grasp of this language in order to comprehend storybooks.

Dialogic Reading

One well-researched technique for encouraging children's comprehension and expressive language during read-alouds is called Dialogic Reading.[12] Teachers use the acronym CROWD to remember five types of prompts that engage children in conversations about books:

- Completion questions to focus children on the structure of language in the book, for example, "Brown Bear, Brown Bear, What do you see? I see a red bird looking at ___."[13]
- Recall questions to check children's understanding of the story's content.
- Open-ended questions to engage children in extended talk about the book.
- *W* questions—*who, what, when, where, why*—to teach vocabulary.
- Distancing or bridging prompts to help children relate ideas in the book to life experiences beyond the story.

Phonological Awareness Activities

Children develop phonological awareness (the ability to hear and manipulate sounds in language) as they learn new vocabulary and differentiate between words that sound similar, such as *cat* and *cot*.[14] Types of phonological awareness for pre-K children include:

- Rhyming—the ability to notice that two or more words have endings that sound the same (also called rimes or word families).
- Alliteration—the ability to notice that two or more words begin with the same sound (also called onsets).
- Sentence segmenting—the ability to sense individual words in the stream of spoken language.
- Syllable blending and segmenting—the ability to hear the separate syllables in a word, and to put syllables together orally to make a word or break a word into separate syllables.

Pre-K teachers should provide instruction in phonological awareness by reading aloud books that focus on rhyming and alliteration, singing songs, chanting nursery rhymes, and using musical instruments to clap out words and syllables.

II. Literacy

Young children who are engaged in meaningful, knowledge-building experiences with print gain the foundational skills for becoming skilled readers and writers. But children who grow up in poverty tend to have fewer experiences with print in their homes, as well as fewer print resources in their neighborhoods.[15] One estimate suggests that children from typical middle-class families experience 1,000 hours of book-reading before entering first grade, while children from low-income families may only experience 25 hours.[16]

Clearly, children arrive at pre-K with varying literacy experiences, but effective teachers can provide rich language and literacy instruction for all children. Rather than teach a set of isolated skills, teachers should integrate literacy instruction into all subject areas in the pre-K classroom, including math, science, social studies, and the arts.[17] In this way, children gain foundational knowledge, vocabulary, and print skills to prepare them to read and comprehend text. For example, in a classroom where children are learning about insects, teachers can:

- Read informational books and storybooks about insects to develop background knowledge and relevant vocabulary, as well as comprehension and book-use skills.
- Engage children in songs and chants about insects to develop phonological awareness while reinforcing content knowledge.
- Encourage children to draw and "write" about insects that they find outdoors or that they investigate in the science center. As children attempt to write, they practice their letter-sound knowledge and develop an understanding of the connection between oral language and print.

Embedding literacy learning within knowledge-building activities is engaging for pre-K children, and it teaches that reading and writing are meaningful and purposeful activities.

Instructional Practices for Literacy

The Alphabetic Principle

In order to learn to read, children must understand that there is a relationship between the sounds in oral language and the letters of the alphabet. Children who arrive at kindergarten knowing letter names and sound-letter matches are on their way to learning to decode (sound out) and spell words.[18]

Pre-K teachers can help children gain an understanding of the alphabetic principle through phonological awareness activities like rhyming, singing, and chanting, and through opportunities to practice recognizing, naming, and producing letters. Teachers can help children to make connections between sounds and letters by reading alphabet books and by systematically introducing children to the letters of the alphabet and their sounds. In addition, pre-K children can learn about letters through a variety of multisensory activities, including play with alphabet manipulatives (e.g., puzzles and magnetic letters) and the opportunity to form letters and write their names using a variety of materials (e.g., with play dough, finger paint, stencils, letter stamps).

Developmental Writing

Developmental writing engages children in actively making the connection between print and oral language. Children who understand that writing is used to communicate ideas and information are interested in attempting to write. At first, children draw pictures to express their ideas on paper, but as they learn the differences between print and illustrations, their writing attempts look more like symbols. As children learn to write their own names, they develop an understanding that writing is made up of letters of the alphabet, and they begin to incorporate letters into their writing attempts. Over time, children learn to use letters to represent specific sounds in words (e.g,. writing *home* as *h* or *hm*). This phonetic (invented) spelling encourages children to connect their phonemic awareness (ability to hear sounds in words) and their alphabet knowledge.

Formal handwriting practice and a focus on correct spelling are not useful instructional techniques for pre-K children. Teachers encourage children's developmental writing when they:

- Write and read back children's dictated words, pointing to each word as it is read aloud.
- Model phonetic spelling during shared writing experiences (e.g., morning message or a thank-you note). Teachers say the word slowly, exaggerating key sounds and then match letters to each sound.
- Create a writing center with a variety of papers and writing tools, and include writing materials in play areas throughout the classroom.
- Encourage children to draw a picture and then to write words about their picture. The picture helps children focus on what to write.
- Accept and encourage all writing attempts.
- Ask children to "read" their story when they are finished. Write children's words on the bottom or back of the page and read the story back to the child to reinforce the connection between oral and written language.

Shared Reading

Reading aloud to children, also called shared reading, is an important way for children to learn about literacy. Shared reading shows children that print carries a message, and repeated readings of familiar books help children learn that this message is consistent and unchanging over time. Teachers must schedule times to read to children individually and in small groups, as young children are better at focusing and engaging in discussion in such situations.

Exposure to a variety of books also enables children to develop their vocabulary and background knowledge, which helps them comprehend more and more complex books. Teachers should purposefully expose children to challenging books from different genres that contain engaging subject matter and sophisticated vocabulary. Reading a variety of books on a similar topic helps deepen children's understanding by reinforcing new vocabulary words and key concepts.

Children also learn about print by watching adults model its use. As teachers read aloud, they can help children understand how text works by intentionally demonstrating concepts of print. These demonstrations work best when teachers read from a big book or lap book with simple print that is large enough for children to see. The book is faced toward the children so they can observe the print as the teacher reads and "thinks aloud" to explain how print works.

Children should learn: how to hold a book correctly; where to find the title and author of a book; where to begin reading; how to turns pages correctly; directionality (a line of text is read from left to right, then down to the left of the line below); the different purposes of text and illustrations; the visual difference between a single letter, a word, and a sentence; that there are spaces between words; and one-to-one correspondence (each word read aloud is represented by one printed word).

A Print-Rich Environment

When classroom environments include appropriate literacy materials organized in an accessible manner, children engage in many literacy behaviors and use complex language.[19] Children learn that print appears in different forms (e.g., books, letters, labels) and that print is used for a variety of purposes (e.g., to inform, to tell a story). They become able to identify the familiar labels and signs in their classroom environment. The experience of being surrounded by print leads children to understand that print carries meaning and that it is practically useful. In print-rich classrooms, children demonstrate this understanding by attempting to read and write during their play. These "pretend" efforts should be encouraged, as they demonstrate children's interest in and engagement with print.

A literacy-rich environment includes:[20]

- A dedicated reading area or library with books stored in an orderly and inviting way.
- Books in a variety of genres and formats (e.g., fiction, nonfiction, alphabet books, big books).
- Books related to curriculum themes or topics that children are studying.
- A dedicated writing area that includes a variety of papers

and writing tools.

- Books and writing materials throughout the classroom (e.g., science books in the science area, paper and crayons in the dramatic play area).
- The alphabet displayed and visible at children's-eye view, with children having access to alphabet toys and manipulatives (e.g., alphabet puzzles, magnetic letters).
- Functional signs that are visible around the classroom (e.g., the class schedule, labels for toy storage, names on cubbies).
- Children's drawing and writing attempts displayed around the room as well as products from group writing experiences (e.g., charts, homemade books).

III. Mathematics

Educators once wondered whether mathematics instruction was appropriate for pre-K children, but an abundance of research shows that children engage in spontaneous mathematics play and demonstrate intuitive understandings about mathematics well before pre-K.[21] However, in mathematics, as with other core content areas, children who grow up in poverty lag behind their middle-class peers in developing key knowledge and skills.[22] Also, children from the United States demonstrate weaker mathematics achievement than children in other parts of the world, and this discrepancy may already be evident as early as kindergarten.[23]

Instructional Practices for Mathematics

Problem Solving

Pre-K mathematics is much more than rote memorization of counting words or names of shapes. Children of this age are capable of engaging in thoughtful mathematics reasoning and problem solving. For example, rather than simply telling children that a shape is a triangle, teachers can ask children to examine several different types of triangles to determine how they are the same. Instead of always lining objects up when they are counted, teachers can ask children to "figure out" how to count objects that cannot be moved. Or, in a collection of multicolored counters, teachers might ask children to try counting only the blue ones. Children should be encouraged to talk about their work and to discuss what they have learned. Through active problem solving using concrete objects, children develop a deep understanding of mathematical concepts.

Mathematics Vocabulary

Pre-K children have intuitive understandings about mathematics, but they have difficulty articulating this knowledge because they lack mathematics vocabulary. Pre-K children may use an imprecise word such as "big" to explain that an object is long, tall, or heavy because they do not know these more descriptive words. Children may also have general understandings of mathematics terms without knowledge of their specific use in mathematics. When a young child asks for "the bigger half" of a sandwich, it is clear that the child does not yet know the precise mathematical meaning of the word *half*. Beyond words for counting, pre-K teachers should introduce and frequently review the following types of mathematics vocabulary:

- Names of two-dimensional and three-dimensional shapes (e.g., *circle, pyramid, cube, hexagon*).
- Words to describe shapes (e.g., *sides, lines, angles, round*).
- Language to compare quantity (e.g., *more than, less than, equal to*).
- Terms to compare length and weight (e.g., *longer, longest, heavier, heaviest*).
- Language related to time (e.g., *earlier, later, morning, night, today, tomorrow*).
- Words that identify where things are in space (e.g., *near, far*).
- Positional words to describe the location of objects (e.g., *inside, underneath, next to*).

Mathematics Manipulatives

Mathematics manipulatives are concrete objects that are easily handled—such as beads, puzzles, and blocks—that children can work with in ways that help them understand and explore mathematics concepts. For example, sorting buttons encourages children to focus on mathematical attributes such as the size and shape of each button as well as the number of holes in each button. Pre-K children need opportunities to use these materials in guided mathematics activities and in free play.

Children are more likely to choose to use mathematics manipulatives during free play when these objects are familiar. Teachers should highlight materials, model ways they can be used, and structure problem-solving activities that help children learn to use the manipulatives. Math materials should be stored in an organized and accessible manner within children's reach. Children need long blocks of time to experiment with these materials.

Curriculum Integration

Pre-K teachers should schedule times dedicated specifically to mathematics, but mathematics can also be integrated into many everyday activities (including free play) as well as content area learning in the pre-K classroom. When a child counts out the correct number of snacks for the children at her table, or the teacher announces that free play will be over in "five minutes," children learn the everyday uses of mathematics.

One way to integrate mathematics and literacy is to use read-alouds to introduce or review mathematical concepts and vocabulary. Children's mathematics knowledge is deepened when teachers connect concepts from books to hands-on mathematics activities so children can apply and practice what they have learned.

Counting, measuring, and graphing can be integrated into almost any social studies or science activity. If children are learning about parts of the body, the teacher can help them to count "how many" of each part people have. This topic also provides the opportunity to introduce the concept of "symmetry." A study of pets provides the opportunity to create a graph displaying the number and types of pets owned by children in the classroom. Making the most of curriculum integration and daily math opportunities requires thoughtful planning, but this type of instruction deepens children's understanding of the practical applications of mathematics.

IV. Science

Young children are naturally curious about the world, and they regularly ask "why" and "how" questions that logically lead to scientific inquiry. In pre-K, children should grow both in their ability to participate in the cycle of scientific inquiry and in their knowledge of science concepts. These activities also build background knowledge and vocabulary that are essential for future science learning as well as for reading comprehension in the elementary years.[24]

Instructional Practices for Science

Scientific Inquiry

Scientific inquiry builds on children's natural desire to discover new knowledge about their surroundings. The goal is to actively engage children in the process that scientists use to answer questions about the world. Teachers guide children as they determine an interesting science question (e.g., What do plants need to grow?) and suggest possible methods to find an answer or explanation. Children then participate in observing and experimenting to determine an answer to their question. As children participate in inquiry and investigations, they gain in-depth knowledge of science content. While children's preconceptions about the world can be resistant to change, active participation in hands-on science experiences is more likely to advance their ideas than simply being told new information.[25]

Careful observation is an important aspect of scientific inquiry, and teachers should provide a variety of opportunities for children to develop this skill. To answer the question "How do trees change in different seasons?" a pre-K class might observe, photograph, and compare a tree in the playground in fall, winter, and spring. This project teaches children the skill of scientific observation as they gain new knowledge about plants and seasons.

Children should learn that scientists use all of their senses to gather information. They should also be exposed to science tools that can aid in the observation process (e.g., magnifying glasses). Recording observations and communicating about what has been discovered are essential to this process.

Science Vocabulary
Children need words to name and discuss the new ideas that they gain through science activities. Pre-K children are capable of learning the correct terminology for the concepts they explore, and it is important for young children to learn to use the language of science. Children should be encouraged to talk about their science explorations and investigations. Children's vocabulary development is encouraged during in-depth studies of key science concepts because they have repeated exposure to new words in a variety of contexts. Science vocabulary for pre-K children includes:

- Words for scientific inquiry (e.g., *predict*, *observe*, *experiment*).
- Words for science activities (e.g., *mix*, *measure*, *compare*).
- Names of science tools (e.g., *magnifying glass*, *balance*, *dropper*).
- Words for careful observation (e.g., *smell*, *see*, *feel*).
- Words to describe properties of objects (e.g., *rough*, *shiny*, *round*).

In addition, teachers should introduce relevant vocabulary as children learn about a specific science topic.

Science Area
An engaging science area encourages children to play and explore using science materials. Free play with science materials helps children generate new questions and practice using the ideas they have learned. If the class is studying the life cycle of butterflies, the science area may include books about caterpillars and butterflies, real larvae or a chrysalis for children to examine, paper for children to draw what they observe, a large-scale model or picture cards of the stages of the life cycle, and appropriate science tools (e.g., magnifying glass) to aid in children's investigation.

Curriculum Integration
Some researchers suggest that mathematics and literacy skills are more meaningful to children when they are taught as part of integrated units of study rather than as isolated skills.[26] For example, there are fundamental mathematics concepts and skills that are necessary to perform most science investigations. These include counting and determining "how many," comparing, classifying, and measuring.

Science investigations provide an opportunity to bring informational texts into daily use in the pre-K classroom. Research demonstrates that shared reading and discussion of information books has many benefits for pre-K children, but this genre is often underutilized in early childhood classrooms.[27] Reading books about content supports background knowledge and vocabulary development, and teaches children that books are a useful place to obtain and communicate information. When reading informative, nonfiction books, teachers should:

- Point out features that are particular to this type of text, such as labeled pictures and diagrams.
- Demonstrate reading to "look up" an answer to a specific question rather than always reading the book from beginning to end.
- Explain new vocabulary and concepts in simple language that children can understand.
- Engage in repeated readings of the same book to reinforce new ideas and vocabulary.

The knowledge that children gain in early childhood is crucially important for their futures, with a quality pre-K experience helping to lay the foundation for the kinds of skills, knowledge, and behaviors that children will be expected to master during school. Indeed, the reading, math, and attention skills that children bring to kindergarten have been found to be a strong predictor of their later academic success.[28] ☐

Endnotes for this excerpt are online at **www.aft.org/pubs-reports/american_educator/issues/spring2009/wright.pdf**.

ABC Partnership

(Continued from page 19)

connection with the entire staff, and so she was able to work with the staff and then work with me."

Bello now has a new principal to work with, Camille Lewis. One of 11 new principals in the district (many retired last year or, like Hixson, moved to the district office), Lewis had worked in previous districts without a formal labor-management partnership. So when union president Rico attended a new principal's meeting over the summer, "I went 'wow!' " Lewis recalls. "It was impressive that Laura takes the time to meet with us." While Lewis has pledged to continue the partnership, she wonders how one aspect of it will work: the P.A.L. assessment.

A Relationship Takes Work

ABC's labor-management partnership has matured enough that teachers and administrators can evaluate it. They realize the relationship is a work in progress, but they also see that it is well worth the effort. One struggle involves a longtime evaluation of school administrators by teachers. For more than 20 years, the union has administered an assessment of district principals. Teachers anonymously rated their principals and wrote comments. The assessment was "something they could rip the principals apart with, quite frankly, and the principals would see it," Rico says. Teachers mailed the completed assessments to the union office and then Rico sent them to the principals to review. Teachers never saw the assessments and the superintendent did not use them in principal evaluations. Still, some of the comments hurt.

At a meeting with the principals last year, Smuts says, he asked, "What is the greatest challenge that remains in moving the labor-management partnership into the schools?" The principals said it was the union's assessment. So the P.A.L. leadership team established a subcommittee of union officers and administrators to create a new assessment. That committee devised an instrument that has widespread support. It still allows teachers to assess their principals, and it has a comment section for recommendations. It also measures the effectiveness of the district's labor-management partnership, and will ultimately be used as a tool for school improvement. (The superintendent has said that he will not use the assessment to evaluate principals.)

To remind everyone of the partnership's purpose, the first page of the P.A.L. assessment includes the ABCFT and district mission statement: "The ABC Partnership is a collaborative effort to improve student achievement and to enhance the teaching and working environment for faculty, staff, and administration through the institutional partnering of colleagues in the ABC Unified School District and the ABC Federation of Teachers. Faculty and administration should have a voice in those decisions that reflect the collaborative efforts and goals of the partnership emphasizing a common understanding of the issues, joint research, sharing of information, mutual respect, and working together to ensure each other's success."

The assessment provides a scale—needs improvement, inconsistent, satisfactory, excellent, and not enough information—to use in answering the survey. Questions are divided into three categories: districtwide, schoolwide, and partnership. Some statements that respondents are asked to assess include the following:

- "The partnership creates an environment where one feels free to question decisions or policies without fear of reprisal."
- "Teaching assignments and room assignments are established in a fair and equitable manner with meaningful staff input to maximize student achievement."
- "The principal and ABCFT representative(s) are working collaboratively to promote and ensure the success of all members of the partnership."

The assessments were distributed to teachers in the middle of January. The principal and building representatives at each school were to review the results and decide how to release them (except for the comments, which only the principal and building representatives see) to the school staff. At press time, assessment results were scheduled to be delivered to school staffs in early March. In January, Smuts said that any problems would be resolved before the results' release. "If it's not a positive experience for the school, then we'll do something about it together."

Both Rico and Smuts are determined to look forward. They refuse to let the district revert to the conflicts of the past. That's why they plan to write the partnership into a memorandum of understanding between the union and the district and present it to the school board in March. Rico and Smuts can't lead forever; one day they'll retire. But they want to ensure that student achievement remains the focus of the partnership they helped establish. "Leadership is critical here," says Saul Rubinstein, the Rutgers professor who spoke at last year's P.A.L. retreat. "The depth of leadership is important for sustaining the partnership into the future."

David Montgomery, a longtime school board member, believes leaders who want to work as partners won't be hard to find. "People will be clamoring to lead us," he says. "We're a model as to what can happen when you work together." ❑

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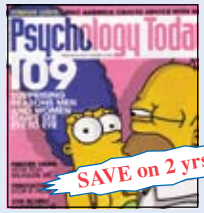

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