



# Literacy Challenges for the Twenty-First Century

VOLUME 22 NUMBER 2 FALL 2012

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# Literacy Challenges for the Twenty-First Century: Introducing the Issue

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*Richard Murnane, Isabel Sawhill, and Catherine Snow*

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**A**dvanced literacy is a prerequisite to adult success in the twenty-first century. By advanced literacy we do not mean simply the ability to decode words or read a text, as necessary as these elementary skills are. Instead we mean the ability to use reading to gain access to the world of knowledge, to synthesize information from different sources, to evaluate arguments, and to learn totally new subjects. These higher-level skills are now essential to young Americans who wish to explore fields as disparate as history, science, and mathematics; to succeed in postsecondary education, whether vocational or academic; to earn a decent living in the knowledge-based globalized labor market; and to participate in a democracy facing complex problems.

The literacy challenge confronting children, their families, and schools in the United States has two parts. The first is the universal need to better prepare students for twenty-first-century literacy demands. The second is the specific need to reduce the disparities in literacy outcomes between children from disadvantaged backgrounds and those from more privileged homes.

This issue of the *Future of Children* explores the literacy of America's children and how to improve it. We begin this introductory essay by reviewing briefly why literacy is so important in today's world and why the concept of literacy needs to be broadened to include a set of competencies that go well beyond the ability to recognize words and decode text. We end with a summary of the other articles in the issue and briefly consider what steps policy makers might take to respond to the urgent needs we cite.

## **The Growing Demand for Strong Literacy Skills**

The "literacy problem" we address here is not that literacy has declined among recent generations of children. It is that today's economy and the complex political and social challenges facing the nation demand more advanced skills than ever before.

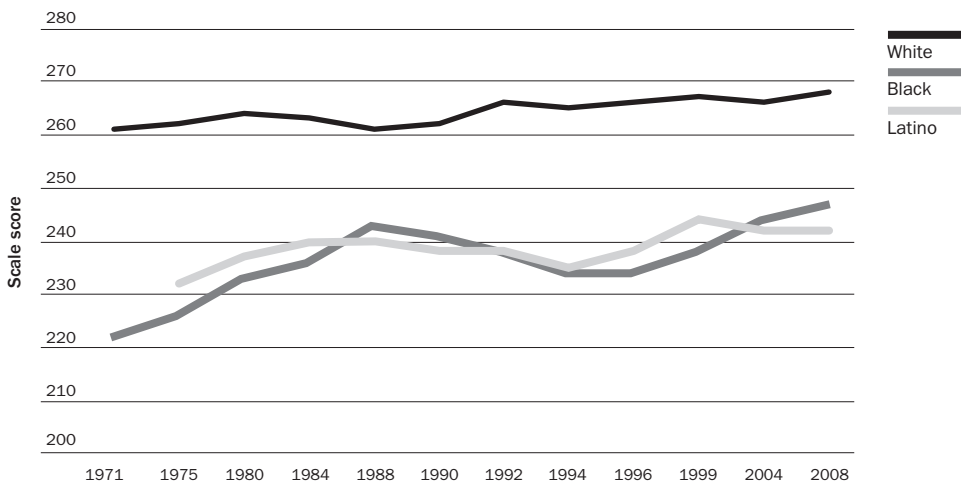
The average reading skill of non-Hispanic white children from recent cohorts is remarkably similar to that of comparable children born in the 1960s, and the average reading achievement of recent cohorts of black children and Hispanic children is considerably higher than that of comparable

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Figure 1. National Assessment of Educational Progress Test Score Trends in Reading: National Averages for Thirteen-Year-Olds (Eighth Grade)



Source: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1971–2008 Long-Term Trend Reading Assessments.

cohorts born several decades ago. These points are illustrated in figure 1, which presents trends from the National Assessment of Educational Progress in the average reading levels of American thirteen-year-olds in the major race and ethnicity groups.

Although the literacy of American children has not changed appreciably over the past forty years, the American labor market has changed dramatically. The change in the nation's occupational structure is illustrated in figure 2, which displays the shares of workers employed in large occupational groups, arrayed from lowest wage on the left to highest wage on the right. The big declines between 1979 and 2009 in the share of workers employed in particular occupations took place in blue-collar jobs (for example, assembly line work) and administrative support (for example, filing). These jobs require workers who can read, but historically they have not demanded advanced literacy skills. Jobs have declined in these occupations

because they can be and have been taken over by computer-guided machines or by workers in lower-wage countries.<sup>1</sup>

During those same three decades the demand for workers in higher-paid occupations, for example, in technical and professional fields, was growing. These jobs typically require postsecondary education or training, leaving workers with inadequate literacy skills competing for the growing number of low-paying service jobs.

Americans also need strong literacy skills to participate constructively in a pluralistic democracy facing complex domestic and global challenges, including a large national debt, global warming, and the proliferation of nuclear weapons. There is no shortage of information about these challenges. Indeed, Internet searches turn up thousands of documents and opinions on every one. But sifting through the conflicting arguments and judging which pieces of evidence hold up to

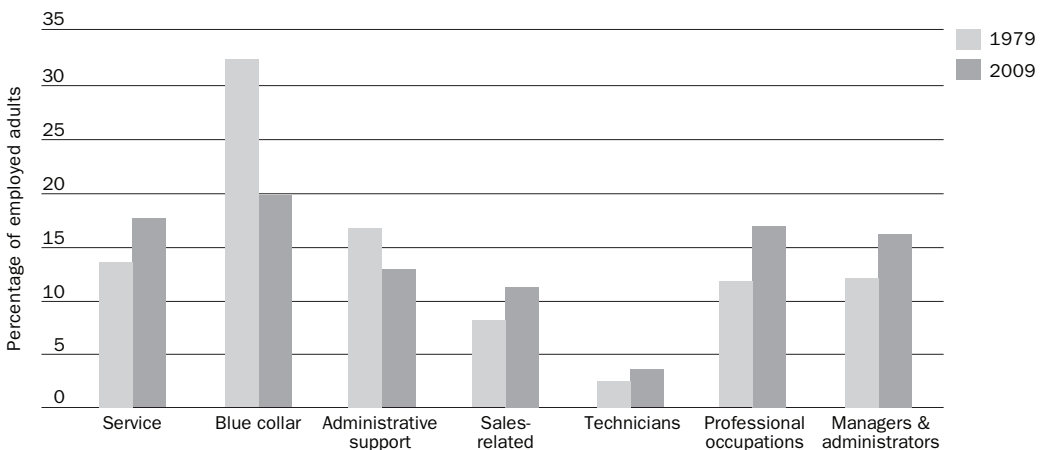
scrutiny require significant literacy skills. The nation's ability to meet these challenges is quite likely to depend on the extent to which the electorate understands them.

Another new challenge is the changing demographic composition of the nation's children. As shown in figure 3, the share of the nation's children who are non-Hispanic whites is declining, while the share of Hispanic children is growing rapidly, and the share of black children is holding relatively constant. As a result, within the next thirty years, Hispanic and black children in the United States will outnumber non-Hispanic white children. As illustrated in figure 1, the literacy skills of Hispanic and black children are significantly lower, on average, than those of non-Hispanic white children. Unless the United States can markedly improve the literacy skills of today's minority children the labor force of the future will have lower literacy skills than the labor force of today.

## Large and Growing Gaps in Literacy Skills by Socioeconomic Status

As noted, our concern in this issue is not only the overall literacy skills of American students, but also the gaps between more and less advantaged children. The disparities associated with family income have grown markedly over the past half century. Among children born during the 1940s, the gap between the average reading achievement of those growing up in families at the 10th percentile of the income distribution and those growing up in families at the 90th percentile of the income distribution was about 0.60 standard deviation. Among cohorts born in the first years of the twenty-first century, the corresponding gap in average reading skills is twice as large, about 1.25 standard deviations. That pattern, documented by sociologist Sean Reardon<sup>2</sup> and illustrated in figure 3 of the article he and his colleagues wrote for this issue, is extremely troubling.

Figure 2. The Adult Occupational Distribution: 1979 and 2009



Source: Authors, based on tabulations of data from the Current Population Survey provided by Professor David Autor of MIT.

Note: The data include all persons aged 16–64 who reported having worked last year, excluding those employed by the military and in agricultural occupations.

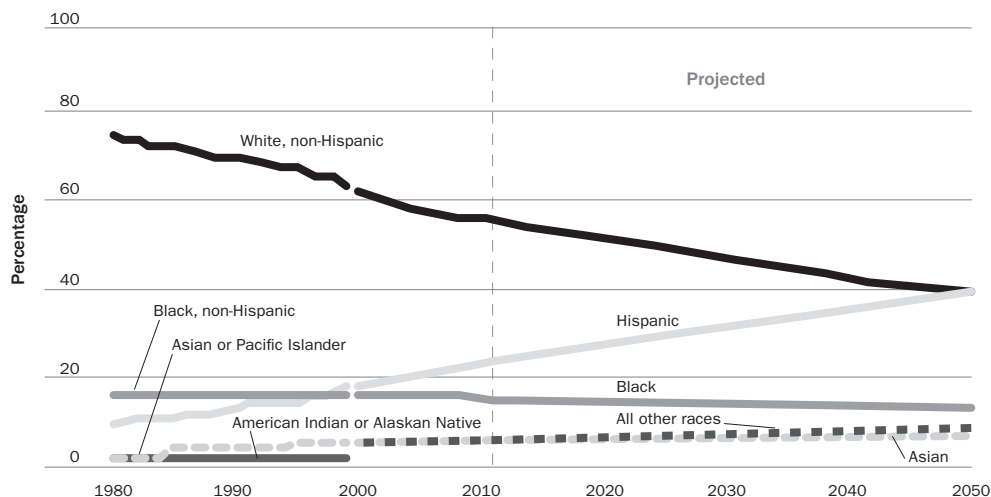
High rates of intergenerational mobility have always been central to the distinctively American belief in opportunity, and education is the primary mechanism driving upward mobility. Low literacy levels among children from less advantaged families dramatically reduce the potential for upward mobility. Preliminary results from the Brookings Institution Social Genome Model show that if the academic success rates of lower- and higher-income children were roughly equal at the end of elementary school, the lifetime incomes of children from lower-income families could grow about 8 percent, or roughly \$83,000, over their careers.<sup>3</sup>

## Literacy Development: It's Not Just Decoding and Summarizing Anymore

If success in the twenty-first century depends increasingly on advanced literacy skills and the education and training they make possible, it is important for educators, policy makers, and the public to understand what advanced literacy is. In short, a new definition of literacy is required—one that highlights the skills that children need to deal with the new demands.

Widely used assessments of reading comprehension typically treat it as a relatively shallow process—one that involves being able to

Figure 3. Percentage of Children Aged 0–17 in the United States by Race and Hispanic Origin, 1980–2010 and Projected 2011–50.



Source: U.S. Census Bureau, Population Estimates and Projections, as found at: [www.childstats.gov/americaschildren/demo.asp#figure1](http://www.childstats.gov/americaschildren/demo.asp#figure1). Data from 2000 onward are not directly comparable with data from earlier years. Data on race and Hispanic origin are collected separately; Hispanics may be any race. In 1980 and 1990, following the 1977 Office of Management and Budget (OMB) standards for collecting and presenting data on race, the decennial census gave respondents the option to identify with one race from the following: White, Black, American Indian or Alaskan Native, or Asian or Pacific Islander. The Census Bureau also offered an “Other” category. Beginning in 2000, following the 1997 OMB standards for collecting and presenting data on race, the decennial census gave respondents the option to identify with one or more races from the following: White, Black, Asian, American Indian or Alaska Native, and Native Hawaiian or Other Pacific Islander. In addition, a “Some other race” category was included with OMB approval. Those who chose more than one race were classified as “Two or more races.” Except for the “All other races” category, all race groups discussed from 2000 onward refer to people who indicated only one racial identity. (Those who were “Two or more races” were included in the “All other races” category, along with American Indians or Alaska Natives and Native Hawaiians or Other Pacific Islanders.)



remember (or quickly find) information read, to summarize a paragraph, to identify the main idea of a paragraph, and perhaps to make simple inferences from information in the text. These assessments typically require reading a series of brief texts and responding to multiple-choice questions based on them or perhaps selecting appropriate words to fill in blanks in the text. Assessments designed to tap the skills that are directly relevant to academic success and to workplace demands require students to synthesize information across different sources, to evaluate arguments on a variety of dimensions, to understand varying perspectives on an issue, and to assess the credibility of sources of information—skills that we will call “deep comprehension.”

Much literacy instruction in U.S. schools is guided, implicitly or explicitly, by “the simple view” of reading.<sup>4</sup> According to this view, reading comprehension depends on accuracy and speed of word reading and on oral understanding of the words to be read. The simple view has had the salutary effect of ensuring that educators recognize the need to include language as well as word reading in early reading instruction. The utility of the simple view declines, though, as the tasks used to tap comprehension become more authentic and more challenging. The simple view does an excellent job of explaining comprehension of the sort that enables a young reader to answer multiple-choice questions about relatively brief and effectively neutral texts. But it is less adequate in reflecting deep comprehension skills—those needed for reading to learn, to synthesize, to analyze, and to critique.

The simple view does not, for example, direct much attention to issues of background knowledge. Schema theories of reading comprehension represent reading comprehension as a process of updating a reader’s

knowledge schemas by integrating information encountered in text with information already stored.<sup>5</sup> If the newly encountered information confirms what is stored in memory, then the reader can comprehend it with ease. If the new information conflicts with that stored in memory, then the reader needs to analyze it for correctness, or at least for credibility, and decide whether to update his or her schema. If the new information agrees with that stored in memory, perhaps extending it, then the reader can learn it relatively easily by updating his or her schema.

Comprehension challenges rise when the text deals with information unconnected to any existing schema in the reader’s knowledge base. Such information is a challenge for developing readers and continues to be an obstacle for mature, skilled readers.

Americans struggle to understand newspaper reports of cricket matches, just as British sports fans do with reports of baseball games. The schemas on which to hang descriptions of runs, innings, outs, and points are specific to the two games and constitute the background required for comprehension.

Ironically, then, one of the most important inputs to successful reading comprehension is knowledge, some of it acquired without reading at all. One major difference between children likely to become good readers and those likely to struggle is vocabulary knowledge. As early as age three, middle-class and disadvantaged children display enormous differences in the size of their vocabulary, because they have had differing experiences with conversations from which they can learn new things.<sup>6</sup> Vocabulary is a convenient index of breadth of knowledge. Knowledge creates the framework on which reading comprehension builds.

## Literacy Instruction: The Ideal and the Real

Excellent reading instruction, then, balances attention to the skills required for accurate and fluent word reading with opportunities to expand students' knowledge and language. Ideally, both these goals are kept in mind at every stage of instruction. In far too many U.S. classrooms, though, attention to language and to knowledge building is severely diminished starting in kindergarten, when letters, then letter-sound pairings, then word reading absorb all the instructional attention.

### Preschool

Good early childhood education provides opportunities to learn emergent literacy skills—to identify letters, to recognize frequently encountered words like “stop” or “exit,” to write one's own name, to know what sounds the initial letters of a word represent, to rhyme, to use knowledge of letter names and letter sounds to produce invented spellings. Reading aloud is often incorporated by teachers into this emergent literacy agenda and is used as an opportunity to point out words and letters in meaningful contexts.

The value of these emergent literacy activities is undeniable. They predict children's skills at kindergarten entry, and children who do better at letter recognition, phonological awareness tasks, and reading words as five-year-olds are very likely to have an easier time learning to read. Children of low-income families are more likely to spend time in under-resourced and informal child care settings (see the article by Jane Waldfogel), where they have less access to these activities and where they miss opportunities to help them catch up to their middle-class peers.

Children from families with more financial and cultural resources differ from their less

advantaged peers, though, not just in knowledge of these early literacy skills but also in access to knowledge about topics related to the natural world (bugs, flowers, tidal pools), to astronomy (what shape the world is, why the sun sets), to current events (who the president is, what a mayor does, what a budget is), to history (why the Civil War was fought, who George Washington was), to human relations (how aunts and uncles are related to them, what divorce means). These differences are indexed by enormous social class differences in vocabulary and are produced by differential access to oral language interactions, exacerbated by differential access to engaging and language-rich books read aloud, both in the home and in early child care settings. Early childhood programs that provide such engaging and language-rich experiences do exist, and preschool practices focused on developing language and enriching knowledge have been shown to be effective.<sup>7</sup> Unfortunately, they are not widespread.

### Primary Grades

Literacy instruction in the primary grades of American schools is generally dominated by practices designed to ensure accurate and fluent decoding of grade-level texts by the end of grade three. Third-grade texts look like this:

It was a fine summer morning,  
So Frances took out her bat and ball.  
“Will you play ball with me?”  
said her little sister, Gloria.  
“No,” said Frances.  
“You are too little.”  
Gloria sat down and cried.  
Frances walked over to her friend  
Albert's house, singing a song:  
*Sisters that are much too small  
To throw or catch or bat a ball  
Are really not much good at all  
Except for crying.*<sup>8</sup>

Texts like this, however charming, offer little opportunity to grapple with deep comprehension. That is entirely appropriate because the technical challenges of reading English are sufficiently daunting that most students need lots of help and lots of practice to get good at it. Practicing deep comprehension while still struggling to decode multisyllabic words may simply be too hard.

On the other hand, children in the primary grades can practice some aspects of deep comprehension while listening to texts read aloud. They are capable of discussing and evaluating competing interpretations of a character's actions and competing explanations for physical phenomena. They are capable of integrating information from different sources, if they have access to those sources with the help of pictures, read-alouds, and videos, or help from better readers.

Observations suggest that primary-grade instruction devotes remarkably little time to science, civics, current events, or social studies, perhaps because of the accountability pressures to ensure that all students leave third grade reading at the third-grade level. Thus, children have the opportunity to learn reading as a tool, but the content that would support their later use of that tool for purposes of comprehension and further learning may be neglected.

### **Middle Grades**

For most American students, ongoing literacy instruction takes place primarily in English language arts after third grade. In grades four and five, English language arts typically offers a variety of text genres and tasks, and students who are still having difficulty learning to read are likely to receive special help. The self-contained classroom model that predominates through grade five facilitates flexible use of

time and some level of attention to literacy across the curriculum.

During the transition to the departmentalized structure of grades six through eight, literacy instruction is severed from content instruction for many students. Excellent readers do not suffer under this regimen; they take the reading skills they have acquired, so far practiced predominantly on fiction in most cases, and adapt them to the reading of science and history textbooks. Well-informed students are also unlikely to suffer; they may already know, from dinner table conversations or from watching PBS and the History Channel, quite a bit about genetic inheritance, survival of the fittest, and the Civil War, so they have richly elaborated schemas on which to hang the new information to which their texts expose them.

But students with marginal reading skills, and good readers with limited knowledge stores, encounter new and often insurmountable tasks. No one teaches them how to read science or history, often because their history and science teachers are unaware of the degree to which the literacy demands of their texts deviate from those of books read earlier, but also because they do not know how to teach reading.

Researchers have devised and evaluated specific procedures that teachers can use to support the growth of reading skills in the postprimary grades. These procedures have in common helping students establish a purpose for reading, modeling how to work actively to understand text, providing strategies to support them in accessing the text, providing explicit instruction about differences in genres and discourse structures across different content areas, teaching crucial presupposed knowledge (vocabulary and information) before exposing students to the text, and

requiring demonstrations of deep understanding (oral and written reports). The procedures have been packaged into various approaches, curricula, and programs. They have not been used as widely, or as well, as the nation requires.

## **The Challenge and a Summary of the Articles in the Issue**

Given the economic demands, the educational challenges, and students' needs for twenty-first-century literacy skills, this issue explores what is known about current levels of literacy, their determinants, and new strategies to improve literacy.

### **Trends in Literacy Levels and Gaps**

Sean Reardon, Rachel Valentino, and Kenneth Shores, all of Stanford University, provide a detailed look at how well U.S. students are performing. They find that about two-thirds of fourth graders, three-fourths of eighth graders, and three-fourths of twelfth graders were reading at a "basic" level in 2011. About one-third of students at each grade level were reading at a "proficient" level. Over the past forty years literacy skills scores on assessment tests have not improved much—in sharp contrast to sizable increases in math scores over this same period. The gaps in literacy skills by socioeconomic status and race are striking. Throughout elementary and middle school, girls consistently score about 0.2 standard deviation above boys; the black-white and Hispanic-white gaps are each about 0.6 standard deviation; and the income gap (10th vs. 90th percentile of family income) is larger still.

While the black-white and Hispanic-white gaps have narrowed somewhat over the past forty years, the socioeconomic gap has widened, and the gender gap has not changed. These gaps do not typically narrow as children progress through school. Indeed, they

sometimes widen. For example, the black-white gap increases between kindergarten and third grade and widens further by eighth grade. U.S. scores are about, or a little above, average compared with those in other developed countries for similarly aged children. The authors conclude that literacy skills need to be improved. They take the narrowing of racial gaps in the past and the reasonable success schools have had in improving math skills as evidence that literacy skills are malleable.

### **Nonschool Factors**

Because literacy gaps are present when children start school, nonschool factors such as families and communities must play a role in the acquisition of literacy skills and likely continue to exert an influence as children age. Jane Waldfogel, of Columbia University, uses the differences between subgroups (by race, socioeconomic status, and immigrant status) to tease out what these influences might be. She notes that parents are critical to children's early literacy. More advantaged parents are more responsive to their children, interact with them more frequently, and provide a richer learning environment through reading and other cognitively stimulating activities, such as use of a computer or visits to a library. Other factors playing a role in the acquisition of early literacy skills that vary with race or socioeconomic status include health and health-related behaviors and participation in preschool.

The reading gaps between black and white children are especially troubling because not only are they evident when children start school but they grow larger during the school years. In contrast, although Hispanic children start out behind (perhaps because of still-limited English skills and lower levels of participation in preschool), the gaps with whites narrow or stabilize after a few years. A

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variety of nonschool factors could be playing a role here, such as stronger families, less crime, or more positive peer group attitudes in Hispanic communities. Another possibility examined in this article is that differences in experiences over the summer for children from different backgrounds contribute to literacy gaps.

Waldfoegel concludes that there is not one literacy problem but several different ones and that this complexity requires tailoring policy responses to these differences. For example, the early literacy of immigrant children tends to be influenced by their lack of English-language skills and the fact that English may not be spoken in the home. The literacy skills of black children and disadvantaged children are more likely to be affected by a lack of cognitively stimulating activities in the home or of other parenting practices that foster literacy and knowledge. Waldfoegel also stresses, however, that out-of-school solutions

are not the answer to out-of-school influences on literacy. Schools can and should address differences in literacy achievement, whatever their source.

### **Progress over the Past Decade?**

In their article, Nell Duke, of the University of Michigan, and Meghan Block, of Michigan State University, describe key recommendations from a 1998 National Research Council report entitled *Preventing Reading Difficulties in Young Children* that were aimed at improving reading instruction in preschool to grade three in U.S. schools. The authors evaluate the extent to which U.S. elementary schools have adopted each of the recommendations and then review research on improving primary-grade reading conducted since the publication of *Preventing Reading Difficulties*. The authors conclude by describing obstacles that have hindered the adoption of several key recommendations of the report.

One conclusion is that reading instruction in the primary grades has moved to a greater emphasis on improving students' word-reading skills—the prerequisite to performing well on early literacy assessments—but that attention to developing children's comprehension, vocabulary, and conceptual knowledge has not increased. Yet these are the skills and knowledge essential to success in comprehending the material in subject-specific texts in the upper elementary and middle school grades. Another important conclusion is that research conducted since *Preventing Reading Difficulties* was published provides considerable additional guidance regarding effective instructional practices.

The authors argue that three obstacles hinder improvement in reading instruction in the early elementary grades. The first is undue emphasis on word-reading skills in assessments



of children's literacy skills in the early grades, which creates incentives for teachers to focus instruction on improving word-reading skills at the expense of the development of the vocabulary, comprehension skills, and conceptual knowledge that children need. The second is a lack of expertise among many educators on how to teach comprehension, conceptual knowledge, and vocabulary effectively. The third obstacle is insufficient time in the school day to teach effectively the vocabulary and conceptual knowledge that some English Language Learners and children from disadvantaged families do not learn outside of school.

### **Improving the Literacy of Disadvantaged Children**

Nonie Lesaux, of Harvard University, describes what is known about reading development and reading instruction for children from low-income and non-English-speaking homes. She uses this research base to provide recommendations for educators and education leaders working to promote the literacy development of these two (often overlapping) academically vulnerable populations. Lesaux begins by explaining that reading is a dynamic and multifaceted process that requires continued development if students are to keep pace with the increasing demands of school texts and tasks. She explains that when reading effectively, readers not only decipher words on a page but also use their accumulating knowledge to assess, evaluate, and synthesize the presented information. She uses the term "skills-based competencies" to describe the skills children need to sound out and recognize words. She contrasts this concept with knowledge-based competencies that include the conceptual and vocabulary knowledge necessary to comprehend a text's meaning.

Lesaux echoes Duke and Block in explaining that U.S. schools have made considerable progress in teaching skills-based reading competencies, as reflected in improved scores on early reading assessments. However, the United States has made much less progress in teaching the knowledge-based competencies students need to support reading comprehension in the later grades. These competencies are key sources of lasting individual differences in reading outcomes, particularly among children growing up in low-income and non-English-speaking households. She suggests that by strengthening the language environments that are part of the everyday school experiences of students from non-English-speaking or low-income homes, or both, educators can support children as they develop the knowledge-based competencies needed to access the school curriculum.

Providing such environments, Lesaux explains, requires considerable shifts in the way reading is assessed and taught in elementary and secondary schools. First, comprehensive reading assessment practices that discern learners' (potential) sources of reading difficulties—in both skills-based and knowledge-based competencies—are required. Second, she describes instructional approaches that offer promise for teaching the conceptual and knowledge-based reading competencies that are critical for academic success. Lesaux concludes that paying greater attention to sustained, comprehensive, and deep instruction, and using assessments that capture complex thinking and learning, will enable educators to augment students' literacy rates—particularly those of academically vulnerable populations.

### **Literacy in the Subject Areas**

Susan Goldman, of the University of Illinois, focuses on what is known about using reading

to learn content, the core educational task from fourth grade through high school. She describes what reading to learn content entails as well as the kinds of knowledge and conceptual skills needed for success at reading for learning. Goldman also explains that the literacy skills needed to acquire knowledge in one subject area, such as history, are quite different from those needed to acquire knowledge in other subject areas, such as biology. Goldman reviews the evidence on instructional interventions aimed at enabling students to acquire and gain proficiency at reading to learn.

A striking lesson from Goldman's article concerns the development of students' literacy skills in middle school and high school. For schools and teachers to assume that students possess the literacy skills needed to learn in the disciplines is a critical mistake. So is leaving to English teachers the task of building the skills of weak readers. Success in enabling students to acquire core knowledge in the disciplines requires teaching subject-specific literacy skills to many students. Currently, few subject-area teachers know how to do this or view it as a fundamental part of their job. Goldman concludes her paper with a brief discussion of what teachers need to know to support students in reading to learn.

### **The Importance of Educational Infrastructure**

David Cohen and Monica Bhatt, both of the University of Michigan, discuss a variety of school-based initiatives and reforms that might address the literacy needs outlined in this issue. They note the existence of a generally accepted body of knowledge about reading instruction at least in the primary grades—but also discuss the organizational features of American schools that inhibit best practice. Although the accountability

that has been introduced by standards-based reform has had some perverse effects, Cohen and Bhatt point out that it has helped to launch some potentially productive initiatives. These include comprehensive school reform designs and charter networks that build educational infrastructure (such as curriculum, professional development, quality control, and data use); programs to attract, reward, and promote better teachers; and perhaps the Common Core State Standards, a multistate initiative to set learning goals for reading/English language arts and mathematics at each grade level. Many challenges are involved in developing these standards and implementing them responsibly. However, if well-structured and well-resourced organizations like comprehensive school reform groups, charter networks, and high-capacity school districts embrace the standards aggressively, they might supply the educational infrastructure that would be needed to enable effective implementation of the standards.

### **The Costs and Benefits of E-Reading**

Gina Biancarosa and Gina Griffiths, both from the University of Oregon, sketch the landscape of “e-reading” today, pointing out that it takes place on a multitude of electronic devices and is rapidly increasing in popularity. This growth in e-reading has introduced new potential sources of economic and educational disparity in students' literacy outcomes. Nonetheless, exploiting the potential of e-reading designed in accordance with universal design principles and evidence-based instructional practices could support engagement as well as success for a wide variety of readers.

E-reading is increasingly used in schools, but there is relatively little information about programs that work well or about the value-added of e-reading approaches to professional development or assessment. All these are

areas that deserve greater attention, given the likely growth of investment by school districts in technology, the increased promotion of e-reading approaches by publishers, and the potential of e-reading to respond to the demands for differentiation of instruction, universal designs for learning, and rapid-turnaround assessments.

## **Rising to the Challenge**

The articles collected in this issue reinforce with data and analysis a growing recognition that policy makers, educators, and school systems have overemphasized technical reading skills and underemphasized conceptual knowledge and analytic skills in preparing students. This point has informed the call in the Common Core State Standards for more attention to informational text and analytical writing in instruction from kindergarten through twelfth grade, and these articles strongly support that shift. The dilemma these articles highlight, though, is that the domain of conceptual and analytical skills is very large and thus that support for development of such skills must be rich, consistent, and multipronged. Children from low-income and non-English-speaking families show poor performance on indexes of conceptual and analytical accomplishment at school entry, suggesting the importance of enhancing their

access to better preschool experiences through programs that provide parental education, home-visiting services, and high-quality center-based care and education. Such children are likely to attend less-well-resourced schools, which underscores the importance of both improving instruction in the schools they attend and providing after- and out-of-school enrichment experiences for them. If such children's educators were the most knowledgeable and most linguistically sophisticated within the teaching corps, the children would more likely experience the kinds of learning environments they need.

Given the breadth of the challenge and the need for multiple points of entry in addressing it, we find it difficult to isolate a single solution or a particularly high-leverage approach. However, if limited to one, we would cite the impact in Finland and Singapore of improving the quality of classroom teachers by limiting access to the teaching profession to the top college graduates and by according teachers the high levels of respect due to professionals engaged in shaping the next generation. This is not a short-term plan, but it is the only one that has worked anywhere at a national scale, and it is almost certainly a prerequisite to the successful implementation of the Common Core State Standards.



## Endnotes

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# Patterns of Literacy among U.S. Students

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*Sean F. Reardon, Rachel A. Valentino, and Kenneth A. Shores*

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## Summary

How well do U.S. students read? In this article, Sean Reardon, Rachel Valentino, and Kenneth Shores rely on studies using data from national and international literacy assessments to answer this question. In part, the answer depends on the specific literacy skills assessed. The authors show that almost all U.S. students can “read” by third grade, if reading is defined as proficiency in basic procedural word-reading skills. But reading for comprehension—integrating background knowledge and contextual information to make sense of a text—requires a set of knowledge-based competencies in addition to word-reading skills. By the standards used in various large-scale literacy assessments, only about a third of U.S. students in middle school possess the knowledge-based competencies to “read” in this more comprehensive sense.

This low level of literacy proficiency does not appear to be a result of declining performance over time. Literacy skills of nine-year-olds in the United States have increased modestly over the past forty years, while the skills of thirteen- and seventeen-year-olds have remained relatively flat. Literacy skills vary considerably among students, however. For example, the literacy skills of roughly 10 percent of seventeen-year-olds are at the level of the typical nine-year-old.

This variation is patterned in part by race, ethnicity, and socioeconomic background. Black and Hispanic students enter high school with average literacy skills three years behind those of white and Asian students; students from low-income families enter high school with average literacy skills five years behind those of high-income students. These are gaps that no amount of remedial instruction in high school is likely to eliminate. And while the racial and ethnic disparities are smaller than they were forty to fifty years ago, socioeconomic disparities in literacy skills are growing.

Nor is the low level of literacy skills particularly a U.S. phenomenon. On international comparisons, American students perform modestly above average compared with those in other developed countries (and well above average among a larger set of countries). Moreover, there is no evidence that U.S. students lose ground relative to those in other countries during the middle school years. Thus, although literacy skills in the United States are lower than needed to meet the demands of modern society, the same is true in most other developed countries.

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**L**iteracy, as the editors note in the introduction to this volume, plays a key role in social mobility, economic growth, and democratic participation. Literacy—the ability to access, evaluate, and integrate information from a wide range of textual sources—is a prerequisite not only for individual educational success but for upward mobility both socially and economically. In addition, because much of the growth in the economy in recent decades has been in areas requiring moderate- to high-level literacy skills, economic growth in the United States relies increasingly on the literacy skills of the labor force. Finally, in an information-rich age, thoughtful participation in democratic processes requires citizens who can read, interpret, and evaluate a multitude of often-conflicting information and opinions regarding social and political choices.

Given the importance of literacy skills, how well do U.S. students read? The answer to this question is not simple, for a number of reasons. The first concerns the kind of “reading” being assessed: sounding out the words in a picture book, reading the instructions on a homework assignment, reading a novel, or evaluating the arguments in an expository text. Each is an example of reading, but each draws on a very different set of skills and competencies. The second reason concerns the benchmark used in the assessment. A comparison of U.S. students’ literacy skills with those of earlier cohorts may show improvement even if actual literacy proficiency rates remain low. A comparison with students in other countries likewise yields information on relative rather than absolute levels of literacy. A comparison of student performance relative to standards of proficiency determined by literacy experts, and taking into account the types of skills needed

for success in the modern economy and for thoughtful participation in democratic processes, may yield yet a different set of answers. A third reason concerns differences among student subgroups. Literacy skills, and trends in literacy skills, may vary by age, by gender, by race and ethnicity, and by socioeconomic background. A full answer to the question of how well U.S. students read must address this variation.

In this article, we describe the reading skills of U.S. students during the elementary and middle school years, when literacy skills are developing most rapidly. We draw on research based on large national and international assessments to describe the development of different types of literacy skills and knowledge as children age, the trends in literacy skills over the past four decades, the variation in literacy skills and trends among subgroups of students, and the relative positions of U.S. students and those in other countries.

## **Dimensions of Literacy**

Literacy encompasses a complex set of skills. At its simplest, it is a combination of word-reading skills and knowledge-based literacy competencies. Word-reading skills, such as decoding and letter-sound awareness, are more procedural in nature and are necessary for reading written text. Knowledge-based literacy competencies include vocabulary knowledge, background knowledge related to the words included in the text, and the ability to integrate these two features with contextual information to make sense of a given text. Knowledge-based competencies also draw on comprehension skills, which enable the reader to draw inferences and conclusions from complex texts, to compare and evaluate the effectiveness of texts, and to interpret and integrate ideas and information, particularly information from discrepant sources.<sup>1</sup>

Table 1. Description of ECLS-K Reading-Proficiency Levels

Classification	Literacy skill	Description
<i>Word-reading literacy skills</i>	Letter recognition	Identifying upper- and lower-case letters by name
	Beginning sounds	Associating letters and sounds at the beginning of words
	Ending sounds	Associating letters and sounds at the end of words
	Sight words	Recognizing common words by sight
	Comprehension of words in context	Reading words in the context of other text
	Literal inference	Making inferences using cues directly stated within the text (for example, understanding the comparison being made in a simile)
	Extrapolation	Identifying clues used to make inferences, and using background knowledge and cues to understand the use of homonyms
<i>Knowledge-based competencies</i>	Evaluation	Demonstrating an understanding of the author's style of cuing the reader in, and making connections between a problem in the narrative and related real-life experiences
	Evaluating nonfiction	Critically evaluating, comparing, contrasting, and understanding the effect of aspects of both expository and biographical texts
	Evaluating complex syntax	Evaluating complex syntax and understanding high-level nuanced vocabulary in biographical text

Source: ECLS-K psychometric reports.

The distinction between these two sets of competencies is not sharp, and their development does not proceed in simple sequential order: children develop vocabulary and background knowledge even before they learn to decode, for example, and continue to build their background knowledge in parallel with the development of complex comprehension skills. Nonetheless, the distinction between word-reading literacy skills and knowledge-based literacy competencies is useful because it elucidates the differences in the types of skills and competencies that various literacy tests assess.

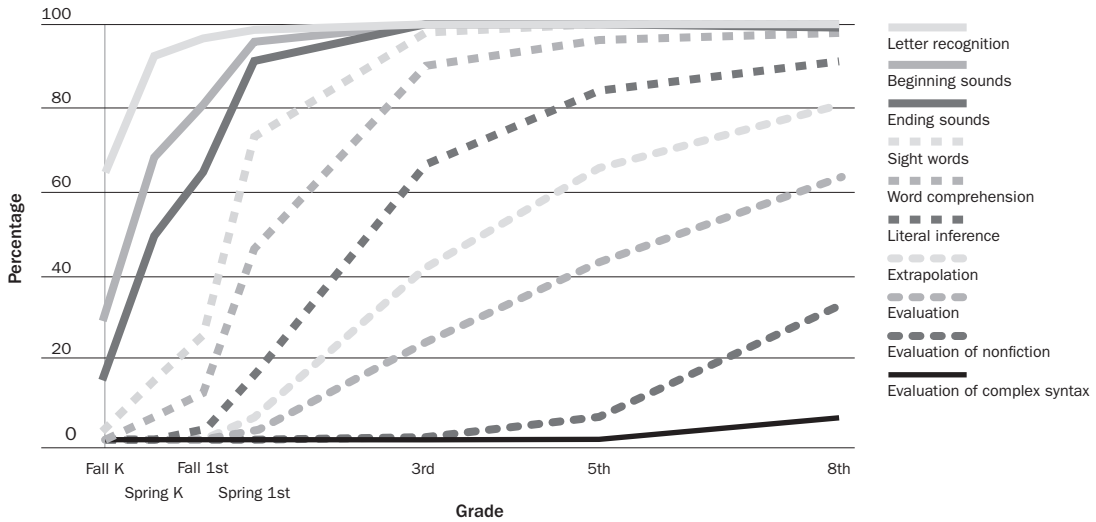
## The Development of Literacy in School

The best source of nationally representative data on how children in the United States develop literacy skills in elementary and middle school is the Early Childhood Longitudinal Study, Kindergarten Cohort (ECLS-K).<sup>2</sup> This study assessed the literacy

skills of a nationally representative sample of roughly 25,000 students as they started kindergarten in the fall of 1998 and then assessed their skills six more times over the next eight years, with the final assessment in the spring of 2007, when the students were in eighth grade. The literacy assessments provide estimates of the percentage of students who were proficient at each point in time in each of ten distinct word-reading skills and knowledge-based competencies.<sup>3</sup> Table 1 describes the ten proficiencies assessed, classifying them as either primarily skill-based or knowledge-based, though as noted, the distinction is not always as sharp as the categorization would imply.

Figure 1, derived from published ECLS-K reports, illustrates the estimated patterns of development of these ten competencies from kindergarten through eighth grade. As the figure shows, most children learn word-reading skills in the first two years of school. A

Figure 1. Percentage of Proficient Students, by Literary Skill, Grades K-8



Source: Authors' calculations from ECLS-K psychometric report data (<http://nces.ed.gov/pubs2009/2009002.pdf>).

majority of children enter kindergarten with basic letter-recognition skills, but only a third can identify the beginning sounds of words, and fewer than 20 percent can identify ending sounds. By the spring of first grade, however, more than 90 percent of children are proficient in these areas, and three-quarters can recognize words by sight, a skill that fewer than 5 percent have mastered at the start of kindergarten. Indeed, by third grade virtually all students can “read” in the procedural sense—they can sound out words and recognize simple words in context.

From first through third grade, most students learn to recognize words by sight, comprehend words in context, and make inferences about text by using cues stated in the text. From third through eighth grade, many students acquire knowledge-based literacy competencies, such as inference based on extrapolation (the ability to use background knowledge and text cues to make inferences and to understand homonyms), evaluation (the ability to

understand the author’s style of presenting information and to make connections between the story and one’s life), and evaluation of nonfiction texts (the ability to critically evaluate and understand aspects of expository and biographical texts). By eighth grade, 81 percent of students are able to extrapolate for inference, 64 percent are proficient in evaluation, and 37 percent are able to evaluate nonfiction. Fewer than 10 percent can evaluate complex syntax, the highest-order literacy skill assessed in the ECLS-K tests.

Although most students acquire considerable literacy skills by eighth grade, acquisition of these skills appears to slow after first grade. One likely reason is that knowledge-based competencies inherently take longer to develop than do word-reading skills. Another reason for the slowdown, however, may be that literacy instruction and curricula are less effective in middle school than in early elementary school. Although the ECLS-K data cannot identify how much of the slower

rate of literacy development in middle school stems from less effective instruction, we show later in this article that U.S. students develop literacy skills during middle school at the same rate, on average, as students in other developed countries.

In reviewing the evidence from the ECLS-K study, one caveat should be noted: the nature of the ECLS-K tests and system used to score them implicitly assume that the ten literacy competencies develop in an invariant sequential order. Literacy is assumed to be a unidimensional skill, a notion that most literacy experts would reject as overly simplistic.<sup>4</sup> This assumption may lead to some distortion of the developmental patterns shown in figure 1, although we suspect the distortions are not substantial. No nationally representative data provide longitudinal evidence of literacy development where literacy is measured as a multidimensional set of competencies. Such data would be very useful in providing a more nuanced understanding of how literacy develops and where instructional and curricular reforms might most productively be targeted.

### **Current Literacy Skills of U.S. Students**

A second source of evidence regarding the literacy skills of U.S. students is the reading tests administered as part of the National Assessment of Educational Progress (NAEP). The NAEP has two components, the so-called Main NAEP assessments and the Long-Term Trend NAEP (NAEP-LTT) assessments. The latter assessments have used a common assessment and scale to measure the reading skills of nationally representative samples of nine-, thirteen-, and seventeen-year-olds since 1971 and so provide descriptions of trends over time in U.S. children's literacy skills. The Main NAEP literacy assessments have been administered to nationally and state-representative samples of fourth, eighth, and

twelfth graders periodically since 1990, and the assessment content has been changed on occasion to reflect current standards and curricula. The main NAEP, unlike the NAEP-LTT, includes both an overall score and subscores for literacy on informational and literary texts. Both assessments primarily evaluate knowledge-based literacy competencies, although clearly students also require word-reading literacy skills to perform well on the tests. The NAEP data do not reveal whether students who score low do so because they lack word-reading skills or knowledge-based literacy competencies, or both.<sup>5</sup>

NAEP results are often reported as the proportion of students who score at a level labeled "proficient" or "advanced." These descriptions do not, by themselves, indicate whether U.S. students are developing literacy skills at an appropriate or acceptable pace. Determining whether a student is "proficient" or "on grade level" requires a set of normative judgments about what skills students of a given age or grade should possess. For the NAEP, such judgments are made by a panel of national reading experts with detailed knowledge of cognitive development, literacy practices, reading curricula, and the literacy demands of modern society. Nonetheless, such judgments are inherently provisional and are subject to change as societal conditions change. Thus, the discussion here also describes the levels of word-reading and knowledge-based competencies in terms of the concrete literacy tasks children are capable of performing.

According to the most recent Main NAEP reading assessments administered in 2011, 67 percent of fourth-graders performed at or above the "basic" level, meaning that they were able to use text to locate information and make simple inferences and to use textual

information to justify opinions. Thirty-four percent of fourth graders performed at or above the “proficient” level, meaning that they demonstrated higher-order reading abilities, such as integrating and interpreting multiple texts and applying text to draw conclusions and make evaluations. Only 8 percent of students scored at the “advanced” level, demonstrating more sophisticated, higher-order knowledge-based competencies, including the ability to make complex inferences and to use text to justify their evaluations.<sup>6</sup> Scores of fourth graders were not significantly different on the informational and literary texts subscales. That only a third of fourth graders performed at the “proficient” level appears consistent with ECLS-K data presented in figure 1, which suggests that roughly a third of fourth graders are proficient in evaluating texts and linking narratives to real-life experiences.

Seventy-six percent of eighth graders in 2011 scored at or above the “basic” level, which means they were able to identify components of a text (such as the main idea, theme, setting, and character for literary texts; and the main ideas, inferences, and supporting details for informational texts), to make some judgments, and to provide support about text content. Thirty-four percent of eighth graders scored at or above the “proficient” level, meaning that they could analyze text features (figurative language for literary texts and rhetorical devices and causal arguments for informational texts), summarize main ideas and themes, and fully justify their evaluations. Only 3 percent of eighth graders scored at the “advanced” level, which requires demonstration of the ability to read literary and informational texts critically, make connections within and across texts, and explain the effects of text features (as opposed to merely identifying them).<sup>7</sup> Like fourth graders, eighth graders scored similarly on the informational and

literary texts subscales. Again, the share of eighth graders who are proficient according to the NAEP standard comports with the ECLS-K data, which shows that roughly 25–30 percent of eighth graders are able to critically evaluate nonfiction texts (see figure 1).

Twelfth-grade results are available only through 2009. Three-quarters of twelfth graders scored at or above the “basic” twelfth-grade level, meaning they could identify elements of meaning and form and could make and provide textual support for inferences and interpretations. Roughly three-eighths of twelfth graders scored at or above the “proficient” level, which means they could locate and integrate textual information using sophisticated analyses of meaning and form and could provide specific textual support for inferences and textual comparisons. Only 5 percent scored at the “advanced” level, meaning that they could analyze and evaluate multiple texts for a variety of purposes.<sup>8</sup> Although twelfth graders scored higher on the informational subscale than on the literary subscale, the NAEP assessments produce little evidence that the literacy skills of twelfth graders in the United States differ significantly between literary and informational texts.<sup>9</sup>

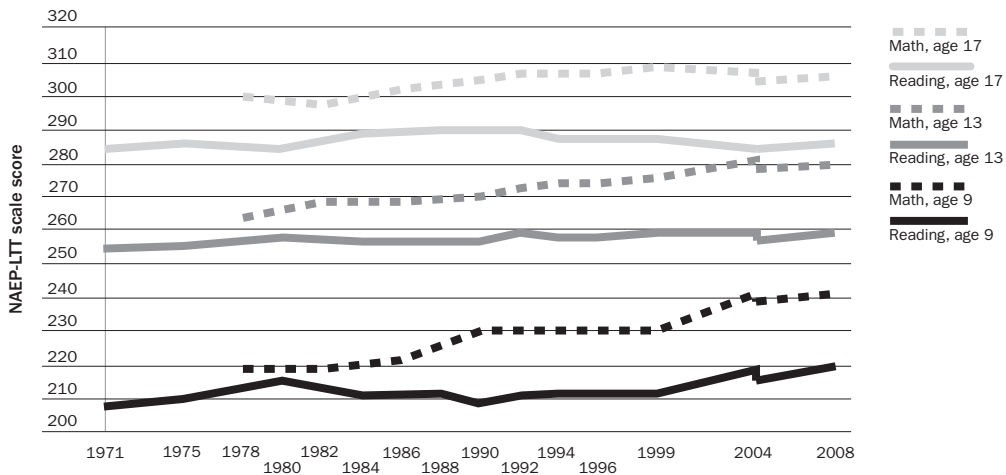
Students’ reading competencies vary substantially across states, however. For example, the proportion of fourth-grade students scoring below “basic” ranged from 49 percent in Louisiana to 20 percent in Massachusetts; only 18 percent scored “proficient” or “advanced” in Louisiana, compared with 47 percent in Massachusetts. Similar variation is evident in eighth and twelfth grades.<sup>10</sup>

### **Trends in Knowledge-Based Competencies**

The most reliable estimates of trends in the literacy skills of U.S. students come from the



Figure 2. Trends in Average NAEP Reading and Math Scores, by Age, 1971–2008



Source: Authors' calculations from NAEP-LTT data (<http://nces.ed.gov/nationsreportcard/ltt>).  
 Note: The assessment format was changed after 2004, indicated by the break in the lines.

NAEP-LTT. Figure 2 illustrates the trends in average literacy and math competencies from 1971 to 2008, the most recent NAEP-LTT assessment year. During this period, the scores of nine-year-olds improved moderately (twelve points, or roughly three-tenths of a standard deviation in NAEP scores), while the average scores of thirteen- and seventeen-year-olds have remained relatively flat (increasing by only five points and one point, respectively).<sup>11</sup> Most of the increase in literacy scores of nine-year-olds appears to have occurred since 1999, and the slight upward trend in scores of thirteen-year-olds from 2004 to 2008 suggests that this increase in the knowledge-based competencies of nine-year-olds may persist through middle school, although more data are needed to determine if this nascent trend continues. Overall, however, figure 2 shows that, despite some evidence of improvements in the most recent decade, the knowledge-based competencies of U.S. students have changed little in the past forty years.

At any given age, students vary considerably in their literacy abilities. For example, at age nine, students scoring at the 10th percentile can carry out simple discrete reading tasks (such as following brief written directions), while students scoring at the 90th percentile are already able to make generalizations and interrelate ideas. At age thirteen, students at the 10th percentile can locate and identify facts and make inferences based on short passages, while those at the 90th percentile can comprehend complicated literary and informational texts. By age seventeen, the most skilled readers can synthesize and learn from specialized reading information, while the least skilled readers are not yet able to make generalizations and interrelate ideas. Roughly 10 percent of seventeen-year-olds have knowledge-based competencies lower than those of the median nine-year-old student.<sup>12</sup>

The NAEP-LTT data also show that the recent gains in reading skills among nine-year-olds are primarily the result of a reduction in

the number of very-low-skilled readers. The literacy scores of a student at the 75th or 90th percentile of the distribution are only slightly higher than they were in 1999, but the scores of a reader at the 10th or 25th percentile are significantly higher. This increase may reflect a deliberate targeting of instruction to more disadvantaged students (as intended by the federal No Child Left Behind legislation), or it may be that advances in the instruction of skills-based competencies have led to modest improvements in the knowledge-based competencies tested by the NAEP. Several recent studies evaluating the effect of the No Child Left Behind reform on NAEP scores, however, find no significant impact either on the average reading scores or on scores at the bottom of the distribution, suggesting that the improvement in the literacy skills of the lowest-skilled readers is not attributable to the legislation.<sup>13</sup>

A useful comparison is the trend in math scores among U.S. students. As figure 2 illustrates, math scores for nine- and thirteen-year-olds have improved substantially in the past three decades. The average math score of nine-year-olds rose by twenty-four points between 1978 and 2008, roughly two-thirds of a standard deviation. The scores of thirteen-year-olds have improved less, by about half of a standard deviation; scores for seventeen-year-olds have changed relatively little over the same period, increasing by roughly one-fifth of a standard deviation. The relatively sizable gains in average math scores among nine- and thirteen-year-olds stand in stark contrast to the smaller or null changes in reading scores over the same time period.

There are three possible reasons for the discrepancy between math and reading gains. First, mathematics instruction may simply have improved over time, while literacy

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*A large proportion of students still completes middle school without mastering the necessary knowledge-based competencies they will need in high school and throughout adulthood.*

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instruction did not. If that is the case, greater effort may be needed to improve literacy instruction in the United States. A second possibility is that the NAEP math and reading assessments emphasize different types of skills. Although math is made up of both procedural (addition, multiplication, algebraic manipulation) and conceptual skills (linking mathematical expressions and operators to real-world quantities and processes), the NAEP-LTT math assessments appear to focus predominantly on procedural skills.<sup>14</sup> In contrast, the reading assessments focus more on knowledge-based competencies than on procedural skills. If students' procedural skills in both math and reading grew significantly over the past thirty years, while their knowledge-based literacy skills and conceptual math skills changed relatively little, these different emphases might produce large gains in the NAEP math assessments but small gains in the NAEP reading assessments. Thus, differences in trends between math and reading NAEP scores may be an artifact of the different types of competencies assessed in the two NAEP tests.

A third possibility, however, is that procedural skills may simply be more constitutive of math than of literacy and that procedural skills are

more “teachable”—more susceptible to improvements in instruction—than are conceptual and knowledge-based competencies. Under this hypothesis, the NAEP-LTT trends in math and reading skills are neither evidence that more could be done to improve reading scores nor an artifact of differential prioritization of procedural skills in the math and reading assessments. Rather they may simply indicate that procedural skills matter more in math, and because procedural skills may be more susceptible to instruction, math scores may have been more responsive than reading scores to schooling reforms (or at least to reforms targeting skills instruction) over the past few decades. Several recent studies showing that the No Child Left Behind legislation improved NAEP math scores but not reading scores would support this argument.<sup>15</sup> A full discussion of this issue is beyond the scope of this article, but clearly one should be cautious about interpreting the very different trends in reading and math scores.

In general, then, NAEP data demonstrate considerable variation in the literacy skills of students, with some students able to perform quite complex literacy tasks and others of the same age and grade level demonstrating more rudimentary ones. And while the average literacy skills of nine-year-olds (and, to a lesser extent, thirteen-year-olds) have improved modestly over the past decade, a large proportion of students still completes middle school without mastering the necessary knowledge-based competencies needed in high school and throughout adulthood.

## Demographic Differences in Literacy Skills

The evidence suggests that many students have not achieved sufficient literacy proficiency by eighth grade to prepare them for success in high school, college, and the labor

force. We now ask how literacy skills vary among subgroups of students defined by race and ethnicity, gender, or socioeconomic background as measured by parental education or family income. A considerable body of research has documented substantial gaps in reading skills between students from low- and high-income families, black and white students, Hispanic and white students, immigrants and nonimmigrants, English-language speakers and non-English-speakers, and male and female students.<sup>16</sup> We summarize these findings, using NAEP and ECLS-K data to illustrate the general patterns.

### Trends in Literacy Skill Gaps

The black-white gap in reading skills was very large in 1970 but narrowed considerably during the 1970s and 1980s. In the early 1970s, average NAEP-LTT reading scores of black students were 1.0–1.2 standard deviations lower than those of white students; by the late 1980s, the black-white gap was roughly half that size, as figure 3 shows. The gap widened modestly in the early 1990s before beginning to narrow again in the late 1990s; that narrowing continued slowly through 2008.<sup>17</sup> This pattern is evident in Scholastic Achievement Test score trends as well as in other large studies with nationally representative samples of students.<sup>18</sup> The most recent NAEP-LTT data (from 2008) indicate that the black-white gap is now roughly 0.6 of a standard deviation, about half of what it was forty years ago, although almost all of the progress in closing the gap was made in the 1970s and 1980s.<sup>19</sup>

The Hispanic-white reading gap followed a similar pattern. About the same magnitude as the black-white gap in 1975, it narrowed substantially in the late 1970s and 1980s before widening slightly in the 1990s and beginning to narrow again in the 2000s.

By 2008 it too had closed to roughly 0.6 of a standard deviation.<sup>20</sup> The size of the Hispanic-white gap varies among subgroups of Hispanics; reading scores are typically lower for Hispanics of Mexican or Central American origin (and higher for those of Cuban, Puerto Rican, or South American origin), for first- or second-generation Hispanic immigrant students, and for Hispanic students who speak primarily Spanish at home.<sup>21</sup>

Differences in average reading skills between Asian-Pacific Islander students and white students are generally relatively small and have been small for the past thirty years, although the small gaps mask some considerable heterogeneity and changing demographics in the Asian-Pacific Islander population.<sup>22</sup> Finally, females consistently outperform males in reading by approximately 0.2 of a standard deviation,<sup>23</sup> the reverse of what is seen in math.

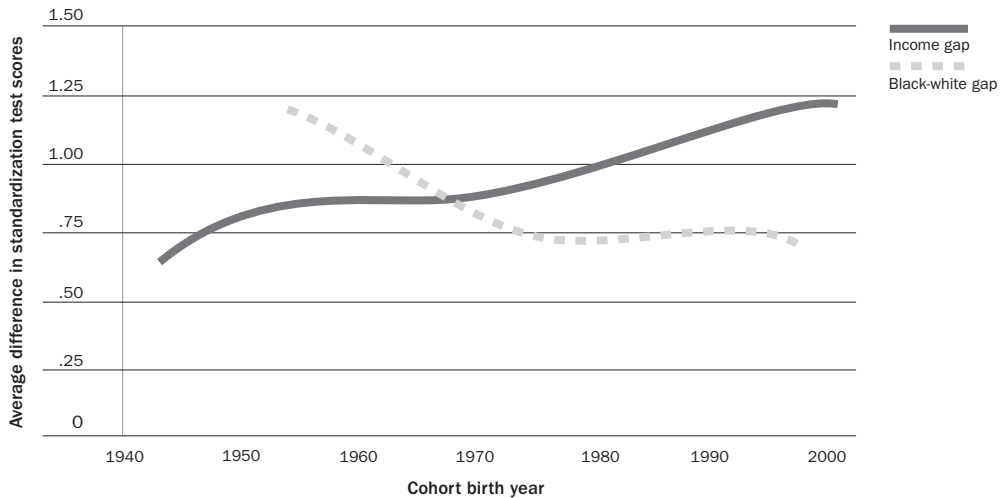
ECLS-K data indicate that socioeconomic disparities in reading achievement are much larger than racial and ethnic gaps. Eighth-grade students from the lowest-income families have, on average, literacy skills comparable to those of third-grade students from the highest-income families; in other words, low-income eighth graders are roughly five years behind high-income eighth-grade students in the acquisition of knowledge-based literacy competencies.<sup>24</sup> These socioeconomic achievement gaps appear to have widened substantially in recent decades.<sup>25</sup> For students born in the 1970s, the reading gap between students from families with incomes at the 90th percentile and those from families with incomes at the 10th percentile was roughly nine-tenths of a standard deviation; for students born in 2000 this “90/10 income achievement gap” was roughly 1.25 standard deviations, 40 percent larger than the preceding generation (see

figure 3).<sup>26</sup> For children born in the 1950s, the reading gap between students from high- and low-income families was smaller than the black-white gap; the income gap is now much larger than the black-white gap.<sup>27</sup>

Several possible reasons lie behind the widening of the income achievement gap. Rising family income inequality is certainly part of the explanation.<sup>28</sup> The ratio of the 90th percentile income to the 10th percentile income has doubled over the past four decades, giving high-income families much more income to invest in their children’s education and cognitive development than they had a generation ago. Data on trends in spending on children appear to support this explanation: overall, families spend much more on child care, preschool, and education today than they did in the early 1970s, and high-income families spend disproportionately more than low-income families. The difference in these expenditures is largest around enrichment activities such as music lessons, travel, and summer camps.<sup>29</sup> In the early 1970s families in the top income quintile invested 4.2 times more a year in child enrichment expenditures than did parents in the lowest income quintile; by 2005 parents in the highest income quintile spent 6.8 times more a year on child enrichment activities than did their counterparts in the lowest income quintile.<sup>30</sup>

But rising income inequality and increased investments in children may not be the full explanation. Not only has the income gap between high- and low-income families widened, but the strength of association between a dollar of family income and children’s academic achievement has grown stronger as well.<sup>31</sup> Money—or attributes correlated with money—appears to matter more for children’s academic achievement

Figure 3. Trends in Income and Black-White Gaps in Reading, 1943–2001 Cohorts



Source: The income gap is the standardized difference in average reading scores between students with family incomes at the 90th percentile of the income distribution and students with family incomes at the 10th percentile.

than it once did. Indeed, family income has become more correlated over time with parental education levels, parents' own cognitive skills, family structure, and neighborhood socioeconomic characteristics.<sup>32</sup> Any or all of these factors may contribute to the widening literacy gaps between high- and low-income children.

### The Development of Literacy Gaps

According to the NAEP, the racial reading gaps are roughly similar in size for nine-, thirteen-, and seventeen-year-olds, as is also true for the ethnicity and gender gaps. Because student reading skills are not assessed before age nine (in the NAEP-LTT) or fourth grade (in the Main NAEP), however, these assessments provide no evidence of how large disparities in literacy skills are for students in early elementary school. Moreover, because the NAEP does not assess the same sample of children repeatedly over time, apparent developmental changes in the magnitude of achievement gaps may be confounded

with differences in the cohorts sampled at different ages. Longitudinal studies, such as the ECLS-K study, provide more detailed evidence regarding the development of reading gaps as children progress through elementary school than is possible with NAEP data.<sup>33</sup>

Evidence from the ECLS-K indicates that the black-white gap in reading skills is roughly half of a standard deviation at the beginning of kindergarten but then widens to about three-fourths of a standard deviation by the end of third grade and to nearly a whole standard deviation by the end of eighth grade (table 2).<sup>34</sup> Most other studies find modest growth in the black-white reading gap during elementary school, although they differ somewhat on the timing and magnitude of this growth.<sup>35</sup>

Most studies using data from cohorts of students born before the 1990s have found that socioeconomic differences between black and white families cannot fully explain the black-white gap in reading scores.<sup>36</sup> In the

Table 2. Achievement Gaps as Children Age, in Standard Deviation Units

Gap	Statistic	Fall kindergarten	Spring kindergarten	Fall first grade	Spring first grade	Third grade	Fifth grade	Eighth grade
White-Hispanic	gap	n.a.	n.a.	n.a.	n.a.	0.62	0.57	0.58
	(se)					(0.04)	(0.05)	(0.04)
White-black	gap	0.41	0.47	0.45	0.53	0.70	0.70	0.86
	(se)	(0.04)	(0.04)	(0.06)	(0.04)	(0.04)	(0.05)	(0.05)
White-Asian	gap	n.a.	n.a.	n.a.	n.a.	0.10	0.07	-0.13
	(se)					(0.05)	(0.06)	(0.07)
Income (90/10)	gap	1.09	0.98	1.07	0.98	1.15	1.14	1.18
	(se)	(0.03)	(0.02)	(0.05)	(0.03)	(0.04)	(0.05)	(0.05)
Male-female	gap	-0.20	-0.23	-0.23	-0.21	-0.19	-0.14	-0.19
	(se)	(0.02)	(0.02)	(0.04)	(0.02)	(0.02)	(0.04)	(0.03)

Source: Authors' calculations. Gap signs reflect the direction of subtraction of mean differences. For example, the male-female gap appears negative because females outperform males on average, so subtracting female means from male means produces a negative number. (se) is the standard error. n.a. means not available.

ECLS-K sample (children born in 1992–93), however, black-white differences in family socioeconomic characteristics, including long-term family income, explain most or all of the racial gap from kindergarten entry through elementary school.<sup>37</sup>

There is less scholarship documenting the development of Hispanic-white and Asian-white reading gaps. Table 2 shows these patterns using data from the ECLS-K study. Because students were given the ECLS-K reading assessment only if they were sufficiently fluent in spoken English, many Hispanic and Asian students were not evaluated in kindergarten and first grade. By third grade, all students were given the reading assessment, so the Hispanic-white and Asian-white gaps reported here are only for students in third, fifth, and eighth grades.

The Hispanic-white reading gap is similar in size to the black-white gap in third grade and is relatively stable from third through eighth grade.<sup>38</sup> Among students proficient in oral

English at the start of kindergarten—roughly two-thirds of all Hispanic kindergarteners in 1998—the Hispanic-white reading gap is large at the start of kindergarten but narrows sharply during kindergarten and first grade (not shown in table 2). In addition, this reading gap narrows most sharply in kindergarten and first grade for Hispanic students whose parents are immigrants and who speak primarily Spanish at home. This narrowing of the reading gap in early elementary school may result from the increased exposure to English text and oral language these Hispanic students encounter in school relative to their homes.<sup>39</sup> Not surprisingly, children who enter kindergarten with limited English proficiency consistently perform worse in reading achievement than their monolingual English-speaking peers through the end of elementary school. The difference in performance between English language learners and their native-speaking peers largely disappears, however, when socioeconomic status is taken into account.<sup>40</sup>



As table 2 illustrates, girls consistently perform roughly two-tenths of a standard deviation higher than boys on reading assessments throughout elementary and middle school. Some research suggests that the female advantage in reading skills grows slightly during kindergarten and first grade and tends to widen over time at the bottom of the skill distribution.<sup>41</sup>

The development of the income-achievement gap as children age is another trend worth noting. The income-achievement gap is 1.2 standard deviations when children enter kindergarten, narrows slightly to 1.1 standard deviations by the end of first grade, but then widens modestly to 1.35 standard deviations by eighth grade.<sup>42</sup> The magnitude of the disparity in reading skills (primarily preliteracy skills) between kindergartners from high- and low-income families is substantial, suggesting that early childhood interventions might be most effective in narrowing these literacy gaps.

### International Comparisons of Literacy Skills

A comparison of the performance of students in the United States and other developed countries is useful for at least two reasons. First, given the importance of literacy skills for economic growth, international comparisons may be helpful for understanding the competitiveness of the U.S. labor force in coming decades. Second, international comparisons provide a benchmark for assessing how successful the U.S. educational system is at teaching literacy skills. A finding that students from other countries outperform U.S. students on literacy tests would suggest that the United States could do better. Moreover, an examination of features of the educational systems in countries that outperform the United States may suggest strategies

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*Given the importance of literacy skills for economic growth, international comparisons may be helpful for understanding the competitiveness of the U.S. labor force in coming decades.*

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that could be used to improve literacy in the United States.

Evidence for such comparisons comes largely from two international studies—the Programme for International Student Assessment (PISA) and the Progress in International Reading Literacy Study (PIRLS). The most recent PISA study, conducted in 2009, provides data on the literacy abilities of fifteen-year-olds in all thirty-four member countries of the Organisation for Economic Cooperation and Development (OECD) and in thirty-one additional non-OECD countries and partners (such as Shanghai and Hong Kong). Similarly, the most recent PIRLS assessment, conducted in 2006, provides evidence of literacy abilities of fourth graders in forty countries (twenty-two of them OECD countries), including the United States. The cohort of students assessed by PIRLS (fourth graders in 2006, born in and around 1996) is roughly the same cohort as assessed by PISA (fifteen-year-olds in 2009, born in and around 1994). Thus, a comparison of international rankings in PIRLS and PISA may be informative not only about where the United States ranks with other countries in literacy but also about whether U.S. students

gain more or less in reading between fourth grade and age fifteen than do students in other countries.

U.S. students generally perform above the international average on both the PIRLS and PISA assessments. In the 2006 PIRLS assessment, six countries had a statistically significant rank above the U.S. average, twenty-one countries ranked below, and eight were not significantly different.<sup>43</sup> The United States performed significantly above the PIRLS scale average, as did thirty-two other countries. The average PIRLS literacy score in 2006 did not change significantly from 2001, when the first PIRLS assessment was given.<sup>44</sup>

In the 2009 PISA study, fourteen countries ranked above the U.S. average, fifty-one ranked below, and eight were not significantly different.<sup>45</sup> The U.S. score was not significantly different from the average score for the thirty-four OECD countries.<sup>46</sup> From 2000, when PISA was first administered, to 2009, U.S. students showed statistically significant but not substantial improvement in reading scores.<sup>47</sup>

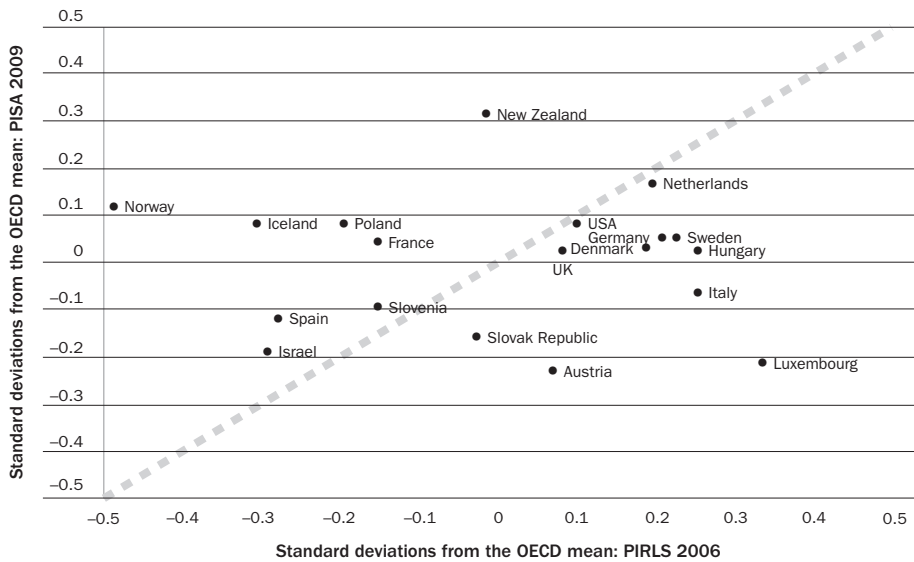
Similarly to the NAEP, PIRLS reports scale scores for student performance in both literary and informational text types. These data can be used to rank the United States and other participating countries.<sup>48</sup> Once again, there is little evidence of an imbalance. In 2006 the United States scored above average in both reading for literary purpose and reading for informational purpose, ranking twelfth in both categories.<sup>49</sup> PISA also reports scores for different text types but refers to them as continuous and noncontinuous texts. Continuous text is prose found in books and newspapers; noncontinuous text is presented as lists, forms, graphs, or diagrams. These constructs are loosely analogous to

literary and informational texts, although informational text can be presented continuously.<sup>50</sup> In 2009 the United States ranked thirteenth in continuous text (not significantly above the OECD average), and fourteenth in noncontinuous texts (significantly above the OECD average), again providing little evidence that the U.S. students perform differently in different literacy domains.<sup>51</sup>

Making comparisons across PIRLS and PISA is difficult, because the tests are different and because a different sample of countries participated in each assessment. To compare the development of reading skills from ages ten to fifteen of U.S. students with those in other countries, we look only at the twenty OECD countries that participated fully in both PIRLS in 2006 and PISA in 2009. In this group the United States ranked eighth in PIRLS and fourth in PISA. Changes in rankings are not an ideal way of comparing the results of the two studies, however, because they can exaggerate small and insignificant differences. Figure 4 provides a comparison of the relative level of reading skills of U.S. students in PIRLS and PISA. The horizontal axis shows each country's average reading score on the PIRLS 2006 assessment, while the vertical axis shows each country's average reading score on the PISA 2009 assessment. Each score is expressed in standard deviations from the mean score across the twenty countries. Thus, in countries above the 45-degree line (such as Norway and New Zealand) students improved in average literacy skills more between ages ten and fifteen than all twenty of these countries did on average. Conversely, in countries below the 45-degree line (such as Luxembourg, Austria, and Italy), fourth-graders scored relatively better in 2006 than did fifteen-year-olds in 2009, indicating lower-than-average rates of literacy growth in middle school in these countries. The United



Figure 4. Standardized Differences in Reading Scores from the OECD Average, by Country, for PIRLS 2006 and PISA 2009



Source: Authors’ calculations from National Center for Educational Statistics PISA data explorer. (<http://nces.ed.gov/surveys/international/ide>).

Notes: Standardized differences were calculated based on the standard deviation in scores among students in the included countries. Three OECD members were not included: Belgium and Canada, because tests were not administered throughout the countries in 2006, and Turkey, because its deviation from the OECD mean (−0.92 in 2006; −0.26 in 2009) made it an outlier.

States lies near the 45-degree line, indicating that U.S. students have average rates of literacy development in middle school relative to this group of countries.

At a minimum, this comparison indicates that U.S. students score slightly above the OECD country average in fourth grade and maintain this position through middle school. This finding suggests that the rate of development of knowledge-based literacy competencies during middle school evident in the United States (see figure 1) is typical of developed countries.

### Conclusion

What does this review of the evidence on the literacy skills of U.S. children tell us? First, the answer to the question of “how well do U.S. students read?” depends on the

specific literacy skills assessed. Almost all U.S. students can “read” by third grade, if reading is defined as being proficient in basic procedural word-reading skills. But reading for comprehension—integrating background knowledge and contextual information to make sense of a text—requires an additional set of knowledge-based competencies in addition to word-reading skills. By the standards used in various large-scale literacy assessments, only about a third of U.S. students in middle school possess the knowledge-based competencies to “read” in this sense.

On international comparisons, American students perform modestly above average compared with those in other OECD countries, and well above average among the larger set of countries for which the PIRLS and PISA studies provide comparative data.

Moreover, there is no evidence that U.S. students lose ground relative to those in other countries during the middle-school years. Between ages ten and fifteen, when most students are learning crucial comprehension and evaluation literacy skills, students in the United States appear to learn at a rate that places them at the average among OECD countries. This evidence of average to above-average performance of U.S. students on literacy assessments is in stark contrast to the poor relative performance of U.S. students on internationally administered math and science assessments.<sup>52</sup>

Although the international literacy assessments may detect no “literacy crisis” in the United States, evidence from the NAEP and the ECLS-K paints a less sanguine picture. The above-average performance of U.S. students on international comparisons does not necessarily mean that their literacy skills are adequate or satisfactory for the demands of the modern economy and modern democracy. As noted, about two-thirds of all students do not attain proficiency in knowledge-based literacy and comprehension skills by the end of middle school. To the extent that high school success, as well as later educational and economic success, depends on the acquisition of these higher-order skills in middle school, many U.S. students enter high school in need of substantial improvement in literacy.

Several pieces of evidence suggest that literacy levels in the United States could be improved. First, mathematics scores have risen much faster over the past few decades, particularly among fourth and eighth graders, than have reading scores. Of course, the same

factors that have led to marked growth in the math skills of U.S. students might not lead to similar gains in literacy skills; intrinsic differences between math and literacy learning may make the former more malleable than the latter. But the math trend does stand as a counterfactual to claims that U.S. schools have been unable to produce meaningful gains in student achievement. Second, white-black and white-Hispanic literacy skill gaps narrowed considerably during the 1970s and 1980s, whereas literacy skill differences by family income have grown in the past few decades. These sizable changes indicate that literacy levels are highly malleable.

Finally, the evidence demonstrates substantial disparities in literacy skills by race, ethnicity, gender, and socioeconomic status. Black and Hispanic students enter high school with average literacy skills three years behind those of white and Asian students; students from low-income families enter high school with average literacy skills five years behind those of high-income students. These are gaps that no amount of remedial instruction in high school is likely to eliminate. And while the racial and ethnic disparities are smaller than they were forty to fifty years ago, socioeconomic disparities are growing.<sup>53</sup> Because the modern economy increasingly rewards educational success, widening socioeconomic gaps in literacy and math skills may reduce opportunities for social mobility. Not only are these disparities a concern for reasons of equity and social justice, but they also may severely limit the U.S. capacity to function effectively as a participatory democracy and to compete in the global economy.

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# The Role of Out-of-School Factors in the Literacy Problem

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*Jane Waldfogel*

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## Summary

When U.S. children enter school, their reading skills vary widely by their socioeconomic status, race and ethnicity, and immigrant status. Because these literacy gaps exist before children enter school, observes Jane Waldfogel, the disparities must arise from conditions outside of schools—from the children’s families and communities. And the same out-of-school factors may continue to influence reading skills as children progress through school.

Waldfogel examines how specific out-of-school factors may contribute to literacy gaps at school entry and to the widening of the gaps for some groups thereafter. Some factors are important across groups. For instance, differences in parenting help explain black-white literacy gaps as well as gaps associated with socioeconomic status. Other factors differ by group. For instance, key influences on early literacy for immigrant children are the language spoken at home, parental proficiency in English, and whether a child participates in preschool.

What happens to early gaps in literacy during the school years also varies by group. Reading gaps for Hispanic children tend to close or stabilize after a few years, perhaps because of such out-of-school factors as strong families, less crime, or better peer group attitudes in Hispanic communities. But black-white gaps and gaps between children from socioeconomically disadvantaged and more advantaged families tend to widen during the school years. An important challenge for future research is to understand why that is the case.

Waldfogel concludes that addressing early literacy gaps, and later gaps, requires tailoring policy responses depending on which group is being targeted. But across all groups, one important conclusion holds. Although out-of-school factors contribute—sometimes in major ways—to literacy disparities, says Waldfogel, schools have a responsibility to try to close such gaps. Research on the out-of-school sources of literacy problems can support schools in this effort by helping practitioners and policy makers better understand which children are likely to encounter problems in literacy and why, as well as what schools and others can do to address those problems.

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American children enter school with substantial disparities in literacy skills, and for some groups of children the disparities widen as they progress in school. Particularly notable at school entry are gaps by socioeconomic status, race and ethnicity, and immigrant status. Because these gaps exist before school entry, the explanation for them must rest with conditions outside of schools—conditions, that is, in the children’s families and communities. As children move through school, such out-of-school factors may continue to influence their progress in literacy, by affecting both learning gains during the school year and learning gains or losses during the summer, when they are not in school.

In this article, I consider the out-of-school factors that influence disparities in literacy at school entry and examine how those and other out-of-school factors may contribute to the widening of these gaps for some groups thereafter. Because the explanations for early gaps in literacy and for their subsequent evolution may vary depending on the particular group considered, I discuss specific at-risk groups separately.

### What Is the Problem?

The literacy problem in the United States is not new. For decades researchers have documented gaps in literacy or literacy-related skills that appear even before children begin school and that in many instances widen thereafter.<sup>1</sup> In 1998 a committee convened by the National Academy of Sciences produced a landmark volume on *Preventing Reading Difficulties in Young Children*.<sup>2</sup> In that study, committee chair Catherine Snow and co-editors Susan Burns and Peg Griffin described the demographics of reading difficulties, noting

that children from poor families, black and Hispanic children, and children attending urban schools were all at elevated risk of poor reading outcomes.

In their article in this issue Sean Reardon, Rachel Valentino, and Kenneth Shores take a look at disparities in literacy today and provide ample evidence that literacy gaps remain a problem in the United States. Consistent with earlier research, they document sizable gaps between students of high and low socioeconomic status; between black, Hispanic, and white students; and between children of immigrants and children of native-born parents.<sup>3</sup> The gaps are present at school entry and tend to widen during the school years for some groups (children of low socioeconomic status and black children) but not for others (Hispanic children).

### Explaining Literacy Skill Gaps at School Entry and Their Evolution Thereafter

Early child development, including growth in early literacy, occurs in the context of tremendous developmental opportunities and risks. Over the past few decades, findings from neuroscience have illuminated the important role of early experiences and gene-environment interactions in shaping cognitive, social, and emotional development, and have pointed to the potentially toxic effects on development of early adverse experiences and stress.<sup>4</sup> The quality and nature of experiences in early childhood lay the groundwork for early literacy development and may also set the stage for potential problems. To the extent that some groups of children are more likely than their peers to experience challenging early environments and less-than-optimal early parenting, they are at risk for problems in literacy as well as in other domains.

To identify specific factors that are associated with problems in early literacy, it is important to understand the process of literacy development. The article in this issue by Nell Duke and Meghan Block provides insights into this process, as does the already noted 1998 National Academy of Sciences volume, *Preventing Reading Difficulties in Young Children*, which emphasizes how early in childhood the foundation for literacy is laid and stresses parents' role in promoting early literacy.<sup>5</sup>

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Indeed, a key factor in early literacy is the role of parents. Parents create a home environment that may provide more or less support for early literacy, through the value they place on literacy and through their provision of books and other reading materials.<sup>6</sup> Parents' reading with their children—including "dialogic reading," in which parents engage children in talking about the books being read to them—is particularly important.<sup>7</sup> Other parent-child verbal interactions also make major contributions to vocabulary development, which is in turn associated with children's early literacy.<sup>8</sup> Children whose parents do not offer a home environment conducive to literacy development, do not read frequently with them, or have limited verbal interactions with them are at elevated

risk of reading problems. Two other key factors in early literacy are the language spoken in a child's home and parental proficiency in English. When parents primarily speak a language other than English at home or are not proficient in English themselves, their children tend to have less exposure to English (unless they receive support for English outside the home or are enrolled in good bilingual education programs) and thus tend to be at higher risk of scoring poorly in early literacy, particularly if assessed in English.

Parents, and other out-of-school factors, affect literacy skills not only before children begin school but also afterward. During the school year, parents can support their children's learning by monitoring and helping with schoolwork and by being involved at school, as well as by enrolling their children in tutoring and enriching extracurricular activities. During the summer, parents can expose children to reading materials and other learning-related activities. Parents of low socioeconomic status are less likely to engage in such activities than are more-advantaged parents, and their children are less likely to have access to learning-related resources, in part because disadvantaged parents may place less value on such resources but also because they have less time and money to invest in them.<sup>9</sup> Such out-of-school factors differ not only by socioeconomic status but also by race and ethnicity and by immigrant status.<sup>10</sup> The links between the lower school achievement of many at-risk groups of children and these out-of-school factors imply that their poorer skills are not due entirely to differences in school quality or other in-school factors.<sup>11</sup>

How important are these factors in explaining early literacy gaps and the progression of later literacy gaps experienced by children of

low socioeconomic status, black and Hispanic children, and children of immigrants? In the sections that follow, I review research findings on both types of gaps for each of these groups. Where available, I draw in particular on studies that attempt to explain gaps by identifying what portion of the gap is accounted for by a particular set of factors. These studies use a decomposition methodology that breaks down the total gap into the portion associated with differences in specific explanatory factors. For a factor to matter in such a decomposition, the two groups for whom the gap is being analyzed must differ on that factor and the factor must have an effect on the outcome in question; if so, that factor contributes to the gap, and the importance of its contribution to the total gap can be calculated. Although such estimates cannot show that a particular factor has a *causal* influence on the gap, they can provide *descriptive* evidence as to how much of the gap might be explained by that factor.

## Gaps Associated with Socioeconomic Status

Family socioeconomic status is strongly correlated both with early literacy (and other academic outcomes) and literacy later in the school years.<sup>12</sup> Socioeconomic status comprises several elements, such as family income, parents' educational attainment, and parents' occupation. Some studies use a composite measure reflecting several of these elements, while others focus on one element (often, family income) as an index of socioeconomic status.

Studies focusing on socioeconomic status-related gaps in literacy have identified several explanations for the poorer early literacy of disadvantaged children. Recent studies single out parenting as the most important explanation. Valerie Lee and David Burkam analyzed

differences in early reading and other school outcomes associated with a composite measure of socioeconomic status, using data from the initial wave of the Early Childhood Longitudinal Study, Kindergarten Cohort (ECLS-K), which assessed children who started kindergarten in the fall of 1998.<sup>13</sup> Lee and Burkam documented large socioeconomic status-related gaps in early literacy (and other outcomes) and then tried to explain the gaps using the decomposition approach described above. They found that several factors related to low socioeconomic status (differences related to race and ethnicity, families' educational expectations, use of child care, and reading, computer use, and television use in the home) helped explain some but not all of the links between low socioeconomic status and early literacy gaps.

In a later analysis, using data on four-year-olds from the Early Childhood Longitudinal Study, Birth Cohort, a large, nationally representative study that followed children born in 2001 to school entry, Elizabeth Washbrook and I compared the early literacy (and other outcomes) of children from families in the bottom fifth of the family income distribution with those of children from families in the middle fifth.<sup>14</sup> In this cohort, low-income children scored at the 34th percentile in early literacy, while middle-income children scored at the 47th percentile, a 13-point gap. Examining a wide range of explanations for the gap in our decomposition analysis, we found that the single most important explanation for the poorer literacy scores of the low-income children was parenting. We considered two distinct parenting constructs. The first, parenting style, included measures of maternal sensitivity and responsiveness, knowledge of infant development, spanking, and rules. The second parenting construct, home

learning environment, included cognitively stimulating activities and items in the home, participation in classes and library visits, and use of computer and television in the home. Differences between low- and middle-income families on these parenting constructs accounted for 42 percent of the literacy gap between low-income and middle-income children (with each of the two constructs contributing about half that amount). Next in importance were family demographics and parental education, which together accounted for 33 percent of the gap. Differences in child care, maternal health and health-related behaviors, and child health together accounted for a further 5 percent, leaving about 20 percent of the total gap unexplained.<sup>15</sup>

Studies have also examined the evolution of socioeconomic gaps in literacy as children move through school.<sup>16</sup> In a recent study, Katherine Magnuson, Elizabeth Washbrook, and I examined the trajectory of such gaps in reading (and math) scores from kindergarten to eighth grade, using data from the ECLS-K for children who were in kindergarten in 1998.<sup>17</sup> The gaps between children with parents with low, medium, and high levels of education held relatively constant between fall and spring of kindergarten but widened thereafter. In particular, children with highly educated parents pulled away from the others over time, while children with the least educated parents lost ground. Detailed regression results indicated that children of the highly educated parents scored 10 points higher on reading than children of the least educated parents at age five, with this gap increasing significantly to 37 points by age fourteen. By age fourteen, in fact, children with the least educated parents had mean reading scores that were about the same as the scores of nine-year-olds with highly

educated parents. Results for socioeconomic status defined by family income, rather than by parental education, were similar.<sup>18</sup>

That gaps in reading remain steady or even narrow a bit in the first year or two of school but then widen thereafter has implications for identifying out-of-school explanations for the gap after school entry. Any such explanations would have to involve factors that are not influential during the first few years of school but become important thereafter. Examples might include more complex learning items or activities, such as a computer in the home, or perhaps peer and community influences that would be expected to increase in importance as children age.

The widening socioeconomic status gaps in literacy may also result at least in part from differences in learning during the summer months, when children typically are not enrolled in school. The U.S. education system is distinctive in its long summer vacations, during which children from families of higher socioeconomic status are more likely than their less advantaged peers to attend summer camps, participate in family travel, or benefit from other learning and enrichment activities. Researchers have thus hypothesized that children from disadvantaged families will experience a relative “summer learning loss,” and empirical studies have generally tended to support this hypothesis.<sup>19</sup> A 1996 meta-analysis of thirteen studies found that low-income students in elementary and middle school lost ground in reading over the summer months both in absolute terms and relative to their higher-income peers (who actually improved their word recognition skills over the summer).<sup>20</sup> More recent studies, using data from the ECLS-K, provide new evidence on summer learning loss between kindergarten and first

grade.<sup>21</sup> As noted, socioeconomic status-related gaps in reading tend to narrow between kindergarten and first grade, suggesting that early school experiences are equalizing, but analyses focused on the summer between the spring of kindergarten and fall of first grade find that they widen. This research thus confirms the important role of summer learning loss in contributing to socioeconomic status-related gaps in literacy.

### Racial and Ethnic Gaps

Gaps in early literacy (and other academic outcomes) between black and white children have been widely documented and studied. Black-white gaps in literacy are already large at school entry, and the gaps roughly double over the school years, although estimates vary depending on the specific data set and measures used.<sup>22</sup> Explanations for these gaps, and for their evolution during the school years, are less clear. Particularly difficult is disentangling the relative role of differences in socioeconomic status and other factors associated with race and ethnicity.

A recent issue of the *Future of Children* on “School Readiness: Closing Racial and Ethnic Gaps,” edited by Cecilia Rouse, Jeanne Brooks-Gunn, and Sara McLanahan, analyzed a variety of possible explanations for these disparities and concluded that as much as half of the black-white gap in school readiness in literacy (and other academic outcomes) could be explained by differences in parenting.<sup>23</sup> In their article in that issue, Jeanne Brooks-Gunn and Lisa Markman documented striking racial differences in parenting: in particular, on average, black parents talked less to their children, were less likely to read to them daily, and had fewer reading materials in their homes, all of which would be expected to result in poorer literacy

among the children.<sup>24</sup> Another important explanation, which Janet Currie estimated might account for up to one-quarter of the black-white gap in early school readiness, involved racial differences in maternal and child health and health-related behaviors (including maternal depression and breast feeding).<sup>25</sup> Katherine Magnuson and I, reviewing differentials in the quality and type of early childhood education and care that black and white children receive, estimated that improving the quality of Head Start, the federal early childhood education program for low-income children that enrolls many black children, could close up to 10 percent of black-white gaps in school readiness.<sup>26</sup>

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*Particularly difficult is disentangling the relative role of differences in socioeconomic status and other factors associated with race and ethnicity.*

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As noted, a challenge in explaining black-white gaps in literacy is sorting out the role played by differences in socioeconomic status. Black children are much more likely than white children to grow up in poverty, with single parents, and with parents who are poorly educated. In their article in the *Future of Children* issue on school readiness, Greg Duncan and Katherine Magnuson estimated that such circumstances might account for as much as half of the early black-white test score gaps, in line with earlier estimates by Valerie Lee and David Burkam, but they cautioned that their estimate was likely to be too



high to the extent that socioeconomic status is correlated with other important factors, such as parenting, health, and child care.<sup>27</sup> Rouse, Brooks-Gunn, and McLanahan concluded that although the varying estimates offered by contributors to the volume cannot simply be added up because the factors involved are likely to overlap and interact, nevertheless most of the black-white gap in early literacy can be accounted for by differences in parenting, health and health-related behaviors, early childhood education, and socioeconomic status, consistent with recent estimates by Roland Fryer and Steve Levitt of gaps in reading (and math) in the ECLS-K.<sup>28</sup>

Although more work remains to be done in understanding the reasons for the black-white gap in early literacy, the evidence suggests that parenting is very important—just as it is in explaining socioeconomic literacy gaps. Health and health-related behaviors and early childhood education also likely play a role. As noted, separating the contributions of socioeconomic status from those of other factors remains challenging, because socioeconomic status and race are correlated.

As with socioeconomic literacy gaps, the black-white gaps in early literacy tend to widen during the school years, so that black children lag even further behind their white peers as they move through school. Because other articles in this issue consider the role of schools themselves in widening or narrowing gaps in later literacy, I review only the research findings regarding the role of out-of-school factors.

Potentially consequential out-of-school explanations for later black-white literacy gaps include differences in parent characteristics and home environments, youth behavior and attitudes, and community attributes such as

crime. Hypothesizing that changes over time may help shed light on how best to explain the gaps, several analysts have evaluated the competing explanations by comparing trend data from periods when black-white gaps for school-age children and youth were narrowing to data from periods when gaps were stagnant or widening.<sup>29</sup> Meredith Phillips, analyzing an extensive set of youth behaviors, such as reading for pleasure, doing homework, and watching television, and parent behaviors, such as limiting television use, found no strong correlation between differential trends in these behaviors for black and white youth and trends in black-white test score gaps.<sup>30</sup> Research by Ron Ferguson, however, suggests that differences in youth culture may help explain not only some of the differential trends in black-white test scores over time but also test score differences at a specific time.<sup>31</sup> In particular, Ferguson has argued that the rise of hip-hop culture and rap music coincided with, and may help explain, a relative decline in black youth reading scores.<sup>32</sup>

As noted, research shows that differential summer learning loss helps to account for some of the lower reading achievement of children of low socioeconomic status. Evidence on summer learning loss and black-white reading disparities has been less clear. Studies using the ECLS-K data between kindergarten and first grade have tended to find that reading gaps between black and white children—unlike gaps by socioeconomic status—do *not* widen during that summer.<sup>33</sup>

Fewer studies have examined gaps in early literacy for Hispanic children, although research in this area is growing rapidly. Because substantial portions of Hispanic children are immigrants or children of

immigrants, I review research on Hispanic children in general as well as studies focused specifically on nonimmigrant Hispanic children in this section. I discuss research on immigrant children and children of immigrants in a separate section below.

The *Future of Children* issue on racial and ethnic gaps in school readiness considered Hispanic-white gaps as well as black-white gaps and found different explanations for them. Although parenting and socioeconomic status were important in explaining both, other contributing factors differed. In particular, Katherine Magnuson and I estimated that equalizing access to center-based preschool, in which Hispanic children are significantly underenrolled, could close as much as 26 percent of the Hispanic-white gaps, with improvements in Head Start closing another 4–8 percent. The role of early childhood education and care, we concluded, was much more important in explaining Hispanic-white gaps in school readiness than in explaining black-white gaps.

Another important difference between black-white gaps and Hispanic-white gaps in literacy (and other academic outcomes) is their trajectory after school entry. Although black-white gaps widen after school entry, Hispanic-white gaps tend either to narrow or to hold stable during the school years.<sup>34</sup> As Sean Reardon and Claudia Galindo have pointed out, that discrepancy suggests that the sources of the gaps during the school years must be different for the two groups.<sup>35</sup> One possibility, they say, is that black youth, but not Hispanic youth, go on to attend poorer-quality schools, an experience that widens the gap. A second possibility is that conditions associated with black youths' parents and their home environments lower both school readiness and subsequent

achievement, while Hispanic youths' initially poor school readiness may have more to do with issues involving language, which are remedied in their first few years of school (as discussed further below).

### Gaps for Children of Immigrants

The literacy skills of children of immigrants vary widely at school entry, with some groups (for example, children of Asian parents) tending to perform significantly better than children of native-born parents while others (for example, children of Latin American parents) tend to perform significantly worse.<sup>36</sup> Differences in socioeconomic resources between immigrant families and native-born families explain a portion, but not all, of these early advantages or disadvantages.<sup>37</sup> More important explanations are the language spoken in the home and parental English language proficiency, which account for a large portion of the differences in early literacy, particularly when (as is most commonly the case) children are assessed in English only.

In a recent study of children entering kindergarten, Wen-Jui Han, RaeHyuck Lee, and I used data from the Early Childhood Longitudinal Study, Birth Cohort, to explore the relative importance of family resources, such as parental income and education as well as language, and aspects of family process, such as parenting as well as parental employment and child care usage, in explaining differences in early reading (and other dimensions of school readiness) between children of immigrants and children of native-born parents.<sup>38</sup> Focusing on children of Mexican immigrants, who tend to have below-average early reading scores, and children of Chinese immigrants, who tend to have above-average scores, the study found that having fewer socioeconomic resources explained some but not all of the lower scores



of children of Mexican immigrants. More important was the lack of English proficiency among parents and their tendency to speak Spanish at home. For children of Chinese immigrants, having greater socioeconomic resources was one factor in their higher early reading scores, while using Chinese at home was a factor in their lower scores, but even after controlling for both, children of Chinese immigrants still had higher scores, suggesting that some other factors were at work. The study also found notable differences in family process between children of immigrants and children of native-born parents. For example, consistent with earlier research, Han, Lee, and I found that children of Mexican parents were much less likely than other children to be enrolled in school- or center-based child care.<sup>39</sup> The lower likelihood of children of Mexican parents being enrolled in child care, however, played only a small role in explaining their lower early reading scores. Robert Crosnoe reached a similar conclusion in his analysis of early math scores using data from the ECLS-K.<sup>40</sup> Findings from studies like these suggest that although enrolling children of immigrants in school- or center-based child care preschool programs would improve their early reading, it probably would not close the gaps between them and the children of native-born parents.<sup>41</sup>

That a lack of exposure to the English language is so important in explaining the poorer early literacy skills among children of immigrants raises the possibility that their initial deficits in literacy might be relatively short-lived and might diminish over time as they learn English in school. In fact, a fair amount of evidence suggests that this is the case. Analyses of the academic trajectories of children of immigrants find that, to a large extent, initial gaps at school entry begin to close as the children move through school,

although these patterns vary by immigrant group.<sup>42</sup> A study by Wen-Jui Han that followed children in the ECLS-K from kindergarten to third grade found that children of Latin American parents made more rapid gains in reading (and math) than other groups, thus narrowing the gaps in test scores between them and other groups over time.<sup>43</sup> Sean Reardon and Claudia Galindo, also using ECLS-K, found that gaps in reading between children of Latin American parents and other groups narrowed rapidly in kindergarten and first grade but were then stable to fifth grade.<sup>44</sup> Both these studies suggest that in-school factors, in particular language instruction, are effective at narrowing literacy gaps for children of immigrants who start school with below-average literacy skills and that out-of-school factors (such as low levels of socioeconomic resources) do not seem to play a major role in hindering the academic progress of children of immigrants once they are in school.

## **Discussion and Policy Implications**

As Reardon, Valentino, and Shores make clear in their article in this issue, the United States does not have one literacy problem but rather several different problems. Gaps in early literacy, for example, vary depending on the group considered. Similarly, the factors underlying those early gaps vary, as do the ways those gaps evolve as children move through school. Solutions to literacy problems, therefore, will need to be tailored depending on which group is being targeted.

For children from socioeconomically disadvantaged homes, the evidence is quite strong that differences in parenting are important in explaining early literacy problems, and thus that parenting programs that promote reading and other literacy-related activities in the home in early childhood may help

boost literacy. The same seems true for black and Hispanic children, for whom evidence likewise strongly suggests that parenting differences are consequential for early childhood literacy. Although the evidence on the effectiveness of parenting interventions has been mixed, several recent experimental evaluations have shown that interventions can increase the time parents spend reading to their children and improve other aspects of parenting, leading to better child outcomes, including literacy skills.<sup>45</sup> Differences in parental education also play a role, suggesting that public investments in education would pay off not just in the labor market but also in improved home environments and school achievement for children.

For children of immigrants, language seems to be the dominant influence in early literacy problems. Encouragingly, many of these children, even if lagging initially in literacy, seem to catch up quite quickly once they start school.<sup>46</sup> So the policy solutions here may have more to do with ensuring both that such children receive high-quality language and literacy instruction when they start school and that they are not penalized for any early problems in literacy. In addition, Hispanic children and children of immigrants could particularly benefit from expanded access to quality preschool programs (such as universal prekindergarten), which have been shown to improve school achievement, with particularly large benefits for at-risk groups.<sup>47</sup>

Analysts have made less progress in understanding out-of-school factors in later literacy. What the research to date suggests, however, is that whatever role such factors play is neither simple nor constant across groups. Early literacy problems for some groups (such as black youth) worsen over time, while for other groups (such as Hispanic youth)

literacy gaps narrow during the school years, and for yet others (such as disadvantaged children) the evolution of the gaps displays both some convergence and widening. To the extent that initial literacy problems and their sources differ, it is perhaps not surprising that their subsequent evolution varies as well. A major task for future research will be to pin down the out-of-school factors associated with later literacy problems for specific groups and to identify appropriate solutions.

Despite these myriad variations, it is still possible to draw some general conclusions about policies to address widening gaps in later literacy. For instance, a growing body of evidence suggests that interventions to address summer learning loss can help keep disadvantaged students from losing ground, or even help them make gains, in literacy during the summer months. A 2000 meta-analysis of thirteen studies and a 2011 review of thirteen later studies found that summer programs can raise student achievement.<sup>48</sup> Many school districts have made learning gains through summer school programs (whether mandatory or voluntary).<sup>49</sup> And several recent experimental studies have found that home-based summer programs that provide books to children have led to reading gains for certain at-risk groups, such as low-income children or black children, although not for English Language Learners.<sup>50</sup>

It is important to stress that the negative influence of out-of-school factors on literacy progress during the school years need not be addressed solely, or even primarily, through out-of-school programs. As ample evidence shows, many disadvantaged children attend schools whose literacy-related resources and experiences are so poor as to amplify the negative influence of out-of-school disadvantages

that at-risk children face.<sup>51</sup> Teachers can and should work to provide the experiences and skills that socioeconomically disadvantaged and other at-risk children are not receiving at home. Recent studies provide some evidence about the types of practices that make teachers more effective in helping disadvantaged children keep up with their better-off peers in reading.<sup>52</sup>

That out-of-school factors contribute—sometimes in major ways—to literacy gaps, does not relieve schools of the responsibility to try to close such gaps. Rather, research on the out-of-school sources of literacy problems can help practitioners and policy makers better understand which children are likely to encounter problems in literacy and why, as well as what schools and others can do to address those problems so that all children in this country attain the literacy skills they will need to succeed in today's economy and society.

## Endnotes

1. See, for example, James Samuel Coleman and others, *Equality of Educational Opportunity* (Washington: U.S. Office of Education, National Center for Educational Statistics, 1966).
2. Catherine E. Snow, M. Susan Burns, and Peg Griffin, eds., *Preventing Reading Difficulties in Young Children* (Washington: National Academies Press, 1998). See also Nell Duke and Meghan Block, “Improving Literacy in the Primary Grades,” *Future of Children* 22, no. 2 (2012).
3. Sean F. Reardon, Rachel A. Valentino, and Kenneth A. Shores, “Patterns of Literacy among U.S. Students,” *Future of Children* 22, no. 2 (2012). The authors also examine some other gaps (for example, gender gaps) besides those focused on here.
4. See, for example, Charles Nelson and Margaret Sheridan, “Lessons from Neuroscience Research for Understanding Causal Links between Family and Neighborhood Characteristics and Educational Outcomes,” in *Whither Opportunity? Rising Inequality, Schools, and Children’s Life Chances*, edited by Greg Duncan and Richard Murnane (New York: Russell Sage Foundation, 2011).
5. Nell Duke and Meghan Block, “Improving Reading in the Primary Grades,” *Future of Children* 22, no. 2, 2012; Snow, Burns, and Griffin, eds., *Preventing Reading Difficulties in Young Children* (see note 2).
6. See, for example, Eileen Rodriguez and Catherine Tamis-LeMonda, “Trajectories of the Home Learning Environment Across the First Five Years: Associations with Children’s Vocabulary and Literacy Skills at Prekindergarten,” *Child Development* 82, no. 4 (2011): 1058–75; Eileen Rodriguez and others, “The Formative Role of Home Literacy Experiences across the First Three Years of Life in Children from Low-Income Families,” *Journal of Applied Developmental Psychology* 30 (2009): 677–94.
7. See, for example, Grover Whitehurst and others, “A Picture Book Reading Intervention in Day Care and Home for Children from Low-Income Families,” *Developmental Psychology* 30, no. 5 (1994): 679–89.
8. See, for example, Betty Hart and Todd Risley, *Meaningful Differences in the Everyday Experiences of Young American Children* (Baltimore: Brookes, 1995).
9. Ariel Kalil and Tom DeLeire, eds., *Family Investments in Children’s Potential: Resources and Parenting Behaviors that Predict Children’s Success* (Mahwah, N.J.: Lawrence Erlbaum, 2004); Neeraj Kaushal, Katherine Magnuson, and Jane Waldfogel, “How Is Family Income Related to Investments in Children’s Learning?” in *Whither Opportunity? Rising Inequality, Schools, and Children’s Life Chances*, edited by Duncan and Murnane (see note 4); Annette Lareau, *Unequal Childhoods: Class, Race, and Family Life* (University of California Press, 2003).
10. See review in Kaushal, Magnuson, and Waldfogel, “How Is Family Income Related to Investments in Children’s Learning?” (see note 9). See also recent evidence on disparities in parenting and time use in Meredith Phillips, “Parenting, Time Use, and Disparities in Academic Outcomes,” in *Whither Opportunity? Rising Inequality, Schools, and Children’s Life Chances*, edited by Duncan and Murnane (see note 4).
11. A key publication in this debate was the Coleman report, which found that much of the black-white achievement gap was explained by out-of-school factors; see Coleman and others, *Equality of Educational Opportunity* (see note 1). See also Richard Rothstein, *Class and Schools: Using Social, Economic, and*

*Educational Reform to Close the Black-White Achievement Gap* (Washington: Economic Policy Institute, 2004).

12. Reardon, Valentino, and Shores, "Patterns of Literacy among U.S. Students" (see note 3).
13. Valerie Lee and David Burkam, *Inequality at the Starting Gate: Social Background Differences in Achievement as Children Begin School* (Washington: Economic Policy Institute, 2002). For earlier analyses of the factors explaining socioeconomic status gaps, see Greg Duncan and Jeanne Brooks-Gunn, eds., *Consequences of Growing Up Poor* (New York: Russell Sage Foundation, 1997).
14. Jane Waldfogel and Elizabeth Washbrook, "Early Years Policy," *Child Development Research* 2011 (2011): 1–12.
15. Parallel estimates of early language and math skills provided similar results, but with parenting playing a larger role for language and a slightly smaller role for math; Waldfogel and Washbrook, "Early Years Policy" (see note 14). Similar results were also obtained in a study analyzing a cognitive composite score from the Early Childhood Longitudinal Study, Birth Cohort; Jane Waldfogel and Elizabeth Washbrook, "Income-Related Gaps in School Readiness in the U.S. and U.K.," in *Persistence, Privilege, and Parenting: The Comparative Study of Intergenerational Mobility*, edited by Timothy Smeeding, Robert Erikson, and Markus Jantti (New York: Russell Sage Foundation, forthcoming).
16. Pedro Carneiro and James Heckman, "Human Capital Policy," in *Inequality in America: What Role for Human Capital Policies?* edited by James Heckman, Alan Krueger, and Benjamin Friedman (Cambridge: MIT Press, 2003), analyze reading and math scores for children age six to twelve from the National Longitudinal Survey of Youth by family income quartile and find that large gradients exist at age six and widen somewhat through age twelve. Analyses of children from the Early Childhood Longitudinal Study, Kindergarten Cohort, find that children from families with more risk factors (defined as income below poverty, primary home language not English, parent with less than high school education, and single-parent family) make less progress in the number of questions answered correctly on reading and math assessments between kindergarten and third grade, suggesting that socioeconomic status gradients widen over that period; Amy Rathbun, Jerry West, and Elvira Germino Hausken, *From Kindergarten through Third Grade: Children's Beginning School Experiences* (Washington: U.S. Department of Education, National Center for Education Statistics, 2004). A much smaller study found that socioeconomic status gaps in cognitive outcomes either narrowed or held constant over the first year or two of school; Deborah Stipek and Rosaleen Ryan, "Economically Disadvantaged Preschoolers: Ready to Learn but Further to Go," *Developmental Psychology* 33, no. 4 (1997): 711–23.
17. Katherine Magnuson, Jane Waldfogel, and Elizabeth Washbrook, "The Development of SES Gradients in Skills during the School Years: Evidence from the United States and England," in *From Parents to Children: The Intergenerational Transmission of Advantage*, edited by John Ermisch, Markus Jantti, and Tim Smeeding (New York: Russell Sage Foundation, forthcoming).
18. Results did change, however, when standardized scores, which express children's achievement relative to the standard deviation of the distribution of scores, were used. In general, results with standardized scores showed less widening of gaps over time but still tended to display the pattern of flat or even converging gaps in the first two years of school followed by widening gaps thereafter.
19. The earliest studies in this line of work include Richard Murnane, *The Impact of School Resources on the Learning of Inner City Children* (Cambridge: Ballinger, 1975); Barbara Heyns, *Summer Learning*

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# Improving Reading in the Primary Grades

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*Nell K. Duke and Meghan K. Block*

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## Summary

Almost fifteen years have passed since the publication of the National Research Council's seminal report *Preventing Reading Difficulties in Young Children*, which provided research-based recommendations on what could be done to better position students in prekindergarten through third grade for success in grade four and above. This article by Nell Duke and Meghan Block first examines whether specific key recommendations from the report have been implemented in U.S. classrooms. They find that recommendations regarding increased access to kindergarten and greater attention to and improvement of students' word-reading skills have been widely adopted. Others have not. Vocabulary and comprehension, long neglected in the primary grades, still appear to be neglected. Contrary to the report's recommendations, attention to building conceptual and content knowledge in science and social studies has actually decreased in the past fifteen years. In other words, the easier-to-master skills are being attended to, but the broader domains of accomplishment that constitute preparation for comprehension and learning in the later grades—vocabulary knowledge, comprehension strategy use, and conceptual and content knowledge—are being neglected. Near stagnation in fourth-grade students' comprehension achievement is thus unsurprising.

The authors then turn to research and reviews of research on improving primary-grade reading published since 1998, when *Preventing Reading Difficulties* was issued. They discuss several instructional approaches identified as effective in improving word-reading skill, vocabulary and conceptual knowledge, comprehension strategies, and reading outside of school; they discuss advances in interventions for struggling readers, and in whole-school literacy reform.

Duke and Block then identify three key obstacles that have prevented widespread adoption of these best practices in teaching reading. The first obstacle is a short-term orientation toward instruction and instructional reform that perpetuates a focus on the easier-to-learn reading skills at the expense of vocabulary, conceptual and content knowledge, and reading comprehension strategies. The second is a lack of expertise among many educators in how to effectively teach these harder-to-master reading skills, and the third is the limited time available in the school day and year to meet unprecedented expectations for children's learning. Policy makers, the education community, and parents must attend to these three challenges if they wish to see meaningful improvements in the reading skills of American children.

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A fourth-grade student is working diligently on the National Assessment of Educational Progress (NAEP) in Reading.<sup>1</sup> The student finishes reading an informational article on the blue crab and then encounters the following question:

The growth of a blue crab larva into a full-grown blue crab is most like the development of

- A) a human baby into a teenager
- B) an egg into a chicken
- C) a tadpole into a frog
- D) a seed into a tree

The answer to this question is not explicitly stated in the text. Reading the words in the question accurately and fluently, while necessary, is not sufficient to answer the question. The fourth-grader also needs vocabulary knowledge (such as understanding the meaning of *larva* and *development*), specific reading-comprehension strategies (the ability to make connections to prior knowledge and draw analogies), and conceptual and content knowledge of the life cycles of four different organisms, in addition to that of the blue crab.

As the student works, the teacher sits anxiously at the head of the classroom, wondering whether all of the school's efforts to improve reading instruction in the primary grades (kindergarten through grade three) will pay off. In recent years, enormous attention and resources have been put into primary-grade education, most notably through the federal No Child Left Behind legislation, enacted in 2001. A central goal of this measure was to have all students reading at grade level by the end of third grade.<sup>2</sup> As Sean Reardon and colleagues document in their article in this issue, fourth-grade achievement on the NAEP has shown some improvement in the past

decade.<sup>3</sup> Yet, two-thirds of fourth- and eighth-grade students still do not reach the "proficient" category, and performance gaps by socioeconomic status are as great as they have ever been.

In this article we consider the role of instruction in the progress, or lack of it, in improving reading achievement in the primary grades. Has reading instruction in the primary grades of U.S. schools changed? If so, in what ways? For better or worse? What important areas and strategies for improvement remain? And what obstacles do schools face in successfully adopting best practices in teaching reading?

### ***The Preventing Reading Difficulties in Young Children Report***

In 1995 the U.S. departments of education and health and human services commissioned the National Research Council (NRC) to study the prevention of reading difficulties. A committee made up of a diverse group of respected experts in reading and related areas investigated various aspects of the problem and, in 1998, issued a report, *Preventing Reading Difficulties in Young Children*. The report was designed to translate research into advice and guidelines about what could be done in preschool through grade three to better position students for reading success in later schooling.<sup>4</sup>

While not without its detractors, the report was widely lauded and can be viewed as representing a broad consensus, as of 1998, regarding how literacy should be developed in the early grades. To answer our questions on the state of reading instruction in the primary grades, we have chosen six key recommendations from the report (listed in table 1), to assess whether and how widely they have been adopted. We then review research and reviews of research published

Table 1. Six Recommendations Drawn from the Report *Preventing Reading Difficulties in Young Children*

Recommendations	Recommendation adopted?		
	Yes	To some degree	No
<i>Kindergarten access</i> : Provide all children “access to early childhood environments [including prekindergarten as well as kindergarten] that promote language and literacy growth and that address a variety of skills that have been identified as predictors of later reading achievement.”		√	
<i>Word-reading skill (and its foundations)</i> : Provide “practice with the sound structure of words; to develop knowledge about print, including the production and recognition of letters.” Provide explicit instruction and practice “that lead to an appreciation that spoken words are made up of smaller units of sounds, [and to] familiarity with spelling-sound correspondences, . . . common spelling conventions and their use in identifying printed words, [and] ‘sight’ recognition of frequent words.”	√		
<i>Vocabulary</i> : Provide instruction “designed to stimulate verbal interaction; to enrich children’s vocabularies.”			√
<i>Conceptual and content knowledge</i> : Engage in “actively building linguistic and conceptual knowledge in a rich variety of domains.”			√
<i>Comprehension strategies</i> : Promote comprehension “through direct instruction about comprehension strategies.”			√
<i>Outside-of-school reading</i> : “Promote independent reading outside school by such means as daily at-home reading assignments and expectations, summer reading lists, encouraging parent involvement, and by working with community groups, including public librarians.”	?	?	?

Source: Derived from Catherine E. Snow, M. Susan Burns, and Peg Griffin, eds., *Preventing Reading Difficulties in Young Children* (Washington: National Academy Press, 1998). The ordering, clustering, and some wording of the recommendations are the responsibility of the authors.

since 1998 on reading instruction and discuss the implications of our assessment for improving primary-grade reading.

Some readers may wonder why we have not taken as a basis for our analysis the *Report of the National Reading Panel*, issued in 2000. Developed under the auspices of the National Institutes of Child Health and Human Development, this report appears to have had a greater impact on policy and practice, in part because its recommendations influenced the No Child Left Behind legislation. Although the findings from this report and its impact are woven throughout this article, we believe the NRC’s recommendations offer a better point of departure for our discussion for five reasons. First, the NRC report focused specifically on preschool through grade three, whereas the National

Reading Panel report focused on K–12. Second, the authors of *Preventing Reading Difficulties* relied on a methodologically more inclusive body of literature, providing a richer basis for guidelines and recommendations.<sup>5</sup> Notably, *Preventing Reading Difficulties* does not contradict the National Reading Panel but is much broader in its methods and range of recommendations. Third, the National Reading Panel report generated considerably more controversy than *Preventing Reading Difficulties*.<sup>6</sup> Fourth, the National Reading Panel focused exclusively on instructional procedures, whereas *Preventing Reading Difficulties* included information about societal and familial sources of reading difficulties and made recommendations for policy changes that extended well beyond the classroom walls. Fifth, as part of the National Academies, the National Research Council

is arguably the most respected body in the United States for developing a report on a complex and consequential topic such as preventing reading difficulties.

In the nearly fifteen years that have passed since the publication of *Preventing Reading Difficulties*, subsequent research has reinforced its major recommendations. The report's emphasis on developing word-reading skill (and its foundations), building vocabulary and conceptual and content knowledge, teaching comprehension strategies, and promoting reading outside of school have more than stood the test of time.

Of course, as one would hope, subsequent research has offered some new findings that could augment recommendations of the report. For example, several recent studies point to the importance of cognitive flexibility in reading comprehension. Children who are better able to simultaneously consider letter-sound and semantic (meaning) information about words are better comprehenders both in the short and long term.<sup>7</sup> Research also shows that interventions in cognitive flexibility can have significant benefits for reading comprehension in young children.<sup>8</sup> Young children also appear to gain reading comprehension when they are taught about multiple-meaning words, such as *spell* or *plane*, and multiple-meaning sentences such as *The woman chased the man on a motorcycle*.<sup>9</sup> Self-regulation, or the ability to control both emotions and cognition, has been shown to be related to young children's reading development, and intervention in this area has positive consequences for reading achievement.<sup>10</sup> Recognizing that the field continues to develop, for the purposes of this chapter we focus on recommendations for specific instructional attention or practices in long-standing areas within reading pedagogy.

## Implementation of the Six Key Recommendations

The first recommendation concerns access to kindergarten. Ensuring that all children have access to kindergarten is fundamental to providing reading instruction in the primary grades. Although kindergarten remains optional in many states, rates of attendance are high and, we suspect, increasing.<sup>11</sup> Availability of full-day kindergarten programs remains limited in some places, however, despite some evidence that full-day programs are more effective than partial-day programs in fostering literacy and other areas of academic development.<sup>12</sup> Ensuring that all children, particularly those at risk for reading difficulties, have access to full-day kindergarten programs should be a policy priority.

Word-reading skill and its foundations, the subject of the second recommendation, consists of phonological awareness, which is the conscious awareness of the sounds in words (being aware, for example, that *she* has two sounds, /sh/ and /ee/, whereas *sheep* has three, /sh/ /ee/ and /p); knowledge of which letters represent which sounds; decoding, or processes for figuring out the pronunciation of an unfamiliar written word; and rapid recognition of familiar words. Instructional attention to word-reading skill has increased since the publication of *Preventing Reading Difficulties*, especially in kindergarten and first grade, with concomitant improvements in student achievement.

In the only direct comparison study of instruction time spent on word-reading skill that we are aware of, researchers found that first-grade teachers in Reading First schools were spending seven minutes more a day, and second-grade teachers ten minutes more a day, on reading instruction than they had before the institution of Reading First.

(Reading First schools are supported by state grants, which in turn came from the federal government, to, among other things, “ensure that every student can read at grade level or above” by the end of third grade. The creators of the Reading First program explicitly drew on the National Reading Panel report, and not *Preventing Reading Difficulties*, in identifying essential components of reading and reading instruction.)<sup>13</sup> In first grade, those extra minutes tended to be devoted to phonological awareness and phonics. In second grade, the extra minutes included vocabulary and comprehension instruction, as well as phonics.

Whether or not teachers are spending more time on word-reading instruction than they once did, they are clearly spending considerable amounts of time on the activity. Stephanie Al Otaiba and her colleagues observed kindergarten teachers spending an average of 33.15 minutes a day on phonological awareness and phonics instruction—more than half of all time spent on literacy instruction.<sup>14</sup> Carol Connor and others found that first-grade teachers spent an average of 23 minutes on word-recognition and phonics instruction.<sup>15</sup> William Teale and his colleagues noted similar findings in many urban Reading First schools; they also concluded that literacy curricula adopted by these schools favored instruction focused on word-reading skill and its underpinnings.<sup>16</sup> Not surprisingly, students’ decoding ability at the end of first grade in Reading First classrooms has shown gains in recent years.<sup>17</sup>

Even though both reports emphasized the importance of building vocabulary, the third recommendation in *Preventing Reading Difficulties*, very little vocabulary instruction appears to occur in primary classrooms. Tanya Wright observed fifty-five kindergarten

classrooms for a total of 600 hours and found no instances of planned vocabulary instruction in any classroom.<sup>18</sup> Teachers did provide students with word meanings or definitions; however, there was no evidence of repeat exposure to those words or of purposeful teaching of the words. Wright concluded that the vocabulary instruction was opportunistic rather than planned. After observing in 325 K–3 classrooms over a three-year period, Rebecca Donaldson found that fewer than 63 percent of teachers taught vocabulary and that vocabulary instruction constituted less than 5 percent, on average, of a typical teacher’s literacy instruction.<sup>19</sup> Vocabulary instruction of any kind occurred in fewer than half of the observed kindergarten and first-grade classrooms. These two studies testify to the dire state of vocabulary instruction in primary-grade classrooms—a situation that is particularly problematic given the substantial social-class and racial gaps in vocabulary among even young children, and the central role of knowledge of word meanings in comprehension.

The fourth key recommendation we consider called for promoting reading comprehension “by actively building linguistic and conceptual knowledge in a rich variety of domains.” Although vocabulary represents both linguistic and conceptual knowledge, conceptual knowledge is broader than vocabulary knowledge—it includes knowledge about and understanding of the world. How are educators doing in that respect? Jack Jennings and Diane Rentner, the authors of a report written for the Center on Education Policy, determined that, as a result of No Child Left Behind mandates, teachers are spending much more time on skill-focused reading and math instruction at the expense of content-area instruction.<sup>20</sup> The report found that of all content-area instruction, social studies was the most affected,



perhaps because it is not one of the subject areas for which the legislation requires assessment. Other studies are consistent with this finding. In one, researchers found that primary teachers tended to view social studies as one of the least important curricular areas.<sup>21</sup> The same study found that primary teachers were spending less time on social studies instruction than in the past.

Science also appears to have been neglected in recent years. George Griffith and Lawrence Scharmann conducted an online survey of teachers on changes in science instruction since enactment of No Child Left Behind.<sup>22</sup> They found that science instruction had been on the decline in elementary schools even before the No Child Left Behind reading and math mandates were implemented. Those mandates further reduced the instructional minutes devoted to science. The survey found that 59 percent of teachers had decreased science instruction, 71 percent of them by thirty-one to ninety minutes a week. As a result, more than half of the teachers surveyed reported spending less than an hour and a half a week on science instruction.

Considerable evidence shows that primary school students, particularly those in schools that serve large numbers of disadvantaged students, are given few classroom opportunities to learn about the natural and social world through text.<sup>23</sup> This finding is true despite evidence that young children can comprehend and write such texts if given the opportunity<sup>24</sup> and that increasing children's exposure to informational text in the primary grades does not hamper development of word-reading or basic writing skills.<sup>25</sup>

The neglect of informational text in the primary grades constitutes a missed opportunity not only to build social studies and science

knowledge through text but also to build knowledge about this type of text (including indexes, diagrams, maps, tables, and glossaries). This concern may be allayed, however, by the substantial emphasis placed on reading and writing informational text in grades K–5 in the Common Core State Standards. (The Common Core State Standards, published in 2010, were developed through the leadership of the National Governors Association Center for Best Practices and the Council of Chief State School Officers and, to date, have been adopted by forty-five states and the District of Columbia.)

In sum, the time spent on science and social studies instruction has decreased in the primary grades, and no clear increase has been detected in the amount of content-focused text used. While the failure to build conceptual and content knowledge in the primary grades may not affect reading development in the short term, given the role of background knowledge in reading and the demands of tasks such as the NAEP question presented at the outset of this paper, the long-term results of this failure may be substantial.

The fifth recommendation called for specific instruction in comprehension strategies—“deliberate efforts by a reader to better understand or remember what is being read”—that research suggests are associated with stronger reading comprehension skill.<sup>26</sup> Yet little classroom time is devoted to teaching this skill.

In a classic 1978 study, Dolores Durkin found that teachers were spending less than 1 percent of instructional time on comprehension instruction in the intermediate grades.<sup>27</sup> While time spent on comprehension instruction has increased some over the years,



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*While the failure to build conceptual and content knowledge in the primary grades may not affect reading development in the short term, the long-term results of this failure may be substantial.*

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the subject appears to continue to receive relatively little attention. Carol Connor and her colleagues found almost no comprehension instruction in third grade.<sup>28</sup> In her observation of 325 classrooms in twenty-two urban, rural, and suburban schools, Rebecca Donaldson found that K–3 teachers in Reading First classrooms typically spent an average of 23 percent of their literacy instructional time on comprehension instruction.<sup>29</sup> Overall, however, explicit comprehension instruction occurred in only a quarter of the classrooms, typically in whole-group settings. Given these findings, it is perhaps not surprising that Beth Gamse and her colleagues found no statistically significant improvement in students' reading comprehension after participating in Reading First or that U.S. students more broadly have shown little improvement in reading comprehension in NAEP assessments.<sup>30</sup>

The Common Core State Standards may spur greater attention to reading comprehension in the primary grades, particularly if assessments are aligned with them.<sup>31</sup> These standards set high expectations for comprehension, specifying that by the end of kindergarten children will (among many other things) be able, with

prompting and support, to describe the connection between two individuals, events, ideas, or pieces of information in a text and to identify the reasons an author gives to support points in a text. They are also expected to be able to actively engage in group reading activities with purpose and understanding. Notably, the Core Standards initiative identifies these expectations as standards for informational text, so they could be addressed in content-area instruction rather than only in the English language arts or literacy block of the school day.

The sixth recommendation called on schools to promote out-of-school reading activities for their students, as the additional practice and knowledge building this provides is likely to accelerate reading development. We know of no studies that have examined whether schools and school districts have increased or decreased their efforts to promote independent reading outside of school, although efforts to promote such reading have been an element of specific research studies, as we discuss later.

In sum, then, how has reading instruction in the primary grades changed in the fifteen years since publication of *Preventing Reading Difficulties*? Certain aspects of instruction appear not to have changed at all. Most notably, vocabulary and comprehension, long neglected in primary-grade education, still appear to be neglected in classrooms. Not surprisingly, fourth-grade students of low socioeconomic status have shown little improvement in comprehension. But other aspects of instruction have changed. Some of these changes, including increased attention to and improvement in students' word-reading skill and somewhat greater kindergarten access, are for the better. Others, namely, the decrease in attention to

building conceptual and content knowledge in science and social studies, are decidedly for the worse. Teachers are attending to the easier-to-master skills—skills some articles in this issue refer to as procedural. But the broader areas of reading accomplishment that constitute preparation for comprehension and learning in the later grades—referred to elsewhere in this issue as conceptual skills and knowledge—are being neglected. Overall, primary-grade reading instruction shows much room for improvement.

## Areas and Strategies for Improvement

Fortunately, research conducted since *Preventing Reading Difficulties* was published provides considerable additional guidance regarding instructional practices. We highlight some recent research studies and reviews of research that suggest promising strategies for improving primary-grade reading, including for children of low socioeconomic status.

### Word-Reading Skill and Its Foundations

Research continues to demonstrate that many approaches to word-reading skill and its foundations work to improve primary-grade reading. We use as an example instruction in phonological awareness (which, recall, is conscious awareness of the sounds in words).

A review of research on phonological-awareness instruction carried out as part of the work of the National Reading Panel showed several approaches to be effective in aiding children's acquisition of reading and spelling skills.<sup>32</sup> This review also found that underprivileged students benefited from phonological awareness instruction as much as did students from more privileged backgrounds.

The review found that phonological awareness instruction is most beneficial when it is paired with the teaching of phonics, or letter-sound relationships. Similarly, students benefit when teachers teach not only the phonological-awareness skill but also how to apply it. For example, teaching blending (that is, putting sounds together to form a word, as in the sounds /ch/ /i/ /m/ and /p/ to form the word *chimp*) and then showing students how to use that knowledge to decode words is more effective than merely teaching blending and expecting students to make the connection to decoding themselves. (And such instruction is likely to be more effective when focused on words the students actually know, rather than on unfamiliar vocabulary items.) Put another way, instructional time devoted exclusively to phonological awareness may not be as effective as when it is combined with alphabetic and decoding instruction.

Notably, the National Reading Panel recommended limiting instructional time devoted to phonological awareness in kindergarten to no more than eighteen hours in a given year, with no one lesson exceeding thirty minutes.<sup>33</sup> Based on research in this area and our own observations, many kindergarten teachers and programs are spending considerably more time than recommended on this skill. If there is a point of diminishing returns (that is, a point when additional instruction does not mean greater achievement), this additional time might be better spent on relatively neglected curricular areas.

### Vocabulary Instruction

The recommendations in the NRC report regarding promoting vocabulary and conceptual knowledge were prescient. Many studies conducted since 1998 have confirmed that vocabulary, which in part reflects conceptual knowledge, is predictive of the ability of

elementary-school students to comprehend what they read.<sup>34</sup> By the later elementary-school years, vocabulary, and language knowledge in general, surpasses word reading as a predictor of reading comprehension.<sup>35</sup> Moreover, evidence suggests that this relationship is causal, that is, vocabulary instruction promotes reading comprehension.<sup>36</sup>

As explained, vocabulary instruction in the primary grades is often left to chance, and frequently those chances occur in read-alouds, in which the teacher reads a book aloud to the class, often also asking questions and commenting on the text. Although children do seem to learn words simply from being read to, the children who come with an already well-developed vocabulary are often more likely to develop additional vocabulary from the read-aloud, leading to a “rich-get-richer” effect.<sup>37</sup>

Studies show that more deliberate, systematic efforts to develop vocabulary in the primary grades can be effective. Edna Brabham and Carol Lynch-Brown determined that when the reader interacts with the students throughout the read-aloud and encourages discussion of vocabulary terms, students demonstrate higher vocabulary knowledge.<sup>38</sup> The researchers concluded that teacher explanation of vocabulary terms, coupled with students’ discussion of those words throughout the read-aloud, fosters students’ acquisition of new vocabulary.

Isabel Beck and Margaret McKeown examined the impact of what they termed “rich instruction” on kindergarten children’s vocabulary learning.<sup>39</sup> Rich instruction entailed defining words for children during read-alouds, helping children make personal or textual connections with the word, facilitating conversations about examples and

“non-examples” (things the word is or is not or does not describe—for example, a spring is flexible but an iron bar is not) and planning specific encounters with the new word over several days. As a result of rich instruction, Beck and McKeown reported, kindergarten students successfully acquired new, sophisticated vocabulary.

### **Developing Conceptual and Content Knowledge**

Research has also shown the effectiveness of instructional approaches that aim to develop conceptual and content knowledge beyond vocabulary. Of particular note for this article are effective approaches that simultaneously seek to develop conceptual and content knowledge along with literacy skills. One example is the Science IDEAS model, which uses supported reading of age-appropriate text along with hands-on activities to develop knowledge of specific science content (such as measuring tools and types of forces). This model was found to have positive impacts on both science and literacy achievement of first- and second-grade children.<sup>40</sup> An integrated approach to teaching social studies and literacy skills closed the achievement gap between children in low- and high-socioeconomic status school settings on standards-based measures of social studies knowledge and content literacy skills.<sup>41</sup> In sum, research offers many effective approaches for developing vocabulary, conceptual, and content knowledge; the policy challenge is bringing these approaches into widespread use.

### **Promoting Comprehension Strategies**

The call to improve comprehension “through direct instruction about comprehension strategies” mirrored long-standing advice for older learners, but teaching of comprehension strategies was somewhat unusual for

## *U.S. students rank near the bottom of students around the world in their attitudes toward reading.*

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the K–3 population at the time *Preventing Reading Difficulties* was issued. Many years later, in 2010, this recommendation was validated in a review of research by a federal panel focused specifically on ways to improve reading comprehension in the primary grades.<sup>42</sup> This panel gave the recommendation to “teach students to use comprehension strategies” a rare “strong evidence” rating under guidelines issued by the What Works Clearinghouse in the federal Institute of Education Sciences; the rating concerns the strength of causal and generalizable evidence to support recommended strategies, programs, or practices.

Comprehension strategies include predicting, questioning, visualizing, drawing inferences, and summarizing or retelling. The federal panel identified as effective several specific approaches to teaching comprehension strategies. Many of the approaches are consistent with the “gradual release of responsibility” model, in which teachers offer a significant amount of support at the initial presentation and early practice of a strategy and then gradually reduce the level of support as students practice.<sup>43</sup> Teachers cycle back to provide greater support as texts and tasks become more difficult, then again release responsibility slowly as students gain competence.

Applying comprehension strategies is hard mental work, so students need to be motivated

to engage in it, the panel said.<sup>44</sup> Notably, U.S. students rank near the bottom of students around the world in their attitudes toward reading, suggesting that generating motivation is a formidable and challenging task in U.S. schools.<sup>45</sup> Teachers, the panel said, could create a motivating environment, helping students to understand the benefits of reading and to feel successful in their reading, by offering choice in the topics and texts that they read, and by providing opportunities for students to work together to achieve a goal or complete a task.

### **Reading Outside of School**

Research has continued to affirm the importance of reading outside of school. For example, John Guthrie found that fourth-grade students who read only at second-grade level engaged in no outside reading.<sup>46</sup> Fourth-graders reading at third-grade level read for only fifteen minutes a day outside the classroom (including homework). Students reading on grade level read twice as much outside of school (thirty minutes a day), and those reading two grade levels above read for a full hour a day outside of school on average. Guthrie suggests that the benefits of reading outside the classroom are bidirectional: students who are better readers tend to be more interested in reading outside of school, but more reading outside of school also makes students better readers.

Research has revealed specific interventions that bolster reading during summer vacation and that have clear positive effects on reading development of children of low-socioeconomic status, a group whose reading skills often decline over the summer months.<sup>47</sup> For three years, Richard Allington and colleagues provided books to first- and second-grade students to read over the summer; the students could choose the books they

wanted to read. Students who received the books reported more time engaged in reading during the summer than a control group of students who did not receive the books; they also demonstrated significantly higher reading achievement the following fall relative to the control group.<sup>48</sup> Similarly, Jimmy Kim provided books to fourth-grade students of low-socioeconomic status.<sup>49</sup> Kim found that students spent more time reading when they had easy access to books and that reading just four or five books over the course of the summer was enough to reduce the typical decline in these students' reading skills.

### **Putting It All Together: Effective Interventions for Students and Schools**

Researchers have also demonstrated that instructional approaches like those described here can be combined in ways that aid struggling readers and struggling schools. One example, shown to be effective by the What Works Clearinghouse and other reviews, is the Reading Recovery program, which provides one-to-one reading intervention to low-achieving first-graders.<sup>50</sup> Children in the program typically participate in daily thirty-minute tutoring sessions for twelve to twenty weeks.<sup>51</sup> Researchers have found that the program achieves its goal of instilling well-developed reading strategies in its students, and, at least on the scale that has been tested in research, a majority of children leave the program performing similarly to their average-achieving peers.<sup>52</sup> Several other one-on-one interventions have also been shown to be effective.<sup>53</sup>

When instruction is to be provided in small groups, intensive and systematic instruction in foundational reading skills, such as phonemic awareness, phonics, and comprehension, is one of the approaches identified by a What Works Clearinghouse panel on interventions

that help struggling primary-grade readers.<sup>54</sup> The intensive instruction occurs in addition to the core instruction and is given to small groups of students, three to five times a week in twenty- to forty-minute sessions. The instruction should be systematic in that skills are built gradually over time. A particular skill should be introduced in isolation, and then, over time, integrated with other skills. During students' practice of the skill, teachers should provide clear and corrective feedback to support students' ability to use the skill appropriately and effectively.

Research also provides guidance regarding interventions to help whole schools that are struggling to raise the reading skills of their primary-grade students. In a review of that research, Barbara Taylor, Taffy Raphael, and Kathryn Au identify several effective models, including Success for All and the Standards-Based Change Process.<sup>55</sup> Success for All, a widely implemented reform in schools with large numbers of disadvantaged students, involves devoting a ninety-minute period to reading instruction; teachers use detailed lesson plans and the emphases of the lessons include phonics and literal comprehension. The Standards-Based Change Process involves teachers in collaborating to identify characteristics of successful readers that they hope their students will exhibit upon graduation. Based on the vision, the teachers develop a cohesive curriculum to help students achieve the identified characteristics. Another effective approach is Taylor's framework, School Change in Reading, which is based on the premise that students show largest gains in classrooms that, among other things, emphasize high-level discussion of and writing about text. In this model, teachers regularly participate in study groups in which they learn how to instruct in ways that promote higher-level talk (such as making



connections to prior knowledge, discussing themes, and interpreting characters) and effectively teach comprehension strategies and challenging vocabulary. These teachers were able to create learning environments in which students led discussions and wrote about text while also participating in lower-level comprehension activities; teachers balanced instruction of word-recognition skills with instruction of comprehension strategies. In other work, Taylor and her colleagues designed an experiment to determine the effects of the framework on literacy achievement in schools serving large numbers of low-income students.<sup>56</sup> They concluded that students in the experimental group showed significant gains in comprehension; students whose teachers required more higher-order thinking of their students demonstrated greater reading growth.<sup>57</sup>

### Three Obstacles to Improving Primary-Grade Reading

Perhaps the greatest obstacle to improving primary-grade reading is a short-term orientation toward instruction and instructional reform. When the aim is to show reading improvements in a short period of time, spending large amounts of time on word-reading skill and its foundations, and relatively little on comprehension, vocabulary, and conceptual and content knowledge, makes sense. Measurable gains in phonological awareness, alphabet knowledge, and word reading can be achieved quickly, and, for most students, relatively easily. In contrast, gains in comprehension, vocabulary, and conceptual knowledge are harder to measure, at least in young children, and harder to achieve. Yet the long-term consequences of failing to attend to these areas cannot be overstated.

As noted, vocabulary, conceptual and content knowledge, and use of comprehension

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*It appears that teachers make more difference than programs in developing reading comprehension.*

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strategies become increasingly strong predictors of reading comprehension over time. At the extreme, students weak in these areas may sound like good readers but have little understanding of what they read—these are the so-called word callers.<sup>58</sup> More broadly, students whose early home and school experiences do not provide a rich store of vocabulary and conceptual knowledge related to school subjects suffer when they encounter texts that assume ever-greater knowledge bases. Students whose early home and school experiences do not foster strategic comprehension skills struggle as texts become ever more complex. Policy should thus be designed to promote a comprehensive approach to primary-grade instruction that values vocabulary, conceptual and content knowledge, comprehension skills, and motivation, as well as word-reading skill—that is, to encourage instruction that will foster development in the long as well as the short term.

A second major obstacle to improving reading in the primary grades is teacher expertise. Development of vocabulary, conceptual and content knowledge, and reading-comprehension skills cannot be scripted or achieved through curriculum alone. As a case in point, consider the work of Terrence Tivnan and Lowry Hemphill, who studied sixteen urban schools that were considered to be doing at least a “good” job implementing schoolwide literacy reform under one of

four reform models.<sup>59</sup> The models differed enormously in their approaches, yet most children reached grade level in word reading and decoding regardless of approach or teacher. Nonetheless, the researchers reported, setting aside differences in child ability, “the largest source of variability in first-grade outcomes... appeared to be substantial differences” in the instructional skills and orientations of individual teachers. According to the researchers, four-fifths of some teachers’ students, but less than one-fifth of other teachers’ students, met grade-level expectations in reading comprehension at the end of first grade. Wide variations were observed in the strategies individual teachers used to instruct children in decoding and comprehending text as well as “in their skill at orchestrating extended talk about text, practices that have been identified as important for early literacy progress.”<sup>60</sup>

The challenge here is to prepare and—for those already in the field—develop far more teachers who are skilled at improving not only word-reading skill, but also vocabulary, conceptual and content knowledge, and comprehension in their students. Policy makers should focus heavily on this challenge, beginning with decreasing the emphasis on adoption of a “core reading program” as the

means to improve primary-grade reading; it appears that teachers make more difference than programs in developing reading comprehension.

A third key obstacle to improving reading in the primary grades is time. While skillful teaching and intense curriculum can do a great deal, it remains the case that the expectations for what students should know and be able to do by the end of each of the primary grades are greater than they have ever been.<sup>61</sup> Yet the amount of time students spend in school has been essentially unchanged for generations. Educators, policy makers, and parents need to think seriously about whether this situation is tenable in the long term. Lengthening the school day or year, making more deliberate use of time outside of school, making full-day kindergarten available to all children, and investing heavily in preschool education are avenues that should be considered. Of course, adding to the time children spend in school helps only if the nature of what happens during those hours is changed. In the fifteen years since the publication of *Preventing Reading Difficulties*, some improvements have been made in primary-grade instruction, but unquestionably there is a long way still to go.



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# Reading and Reading Instruction for Children from Low-Income and Non-English-Speaking Households

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*Nonie K. Lesaux*

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## Summary

Although most young children seem to master reading skills in the early grades of elementary school, many struggle with texts as they move through middle school and high school. Why do children who seem to be proficient readers in third grade have trouble comprehending texts in later grades? To answer this question, Nonie Lesaux describes what is known about reading development and instruction, homing in on research conducted with children from low-income and non-English-speaking homes. Using key insights from this research base, she offers two explanations. The first is that reading is a dynamic and multifaceted process that requires continued development if students are to keep pace with the increasing demands of school texts and tasks. The second lies in the role of reading assessment and instruction in U.S. schools.

Lesaux draws a distinction between the “skills-based competencies” that readers need to sound out and recognize words and the “knowledge-based competencies” that include the conceptual and vocabulary knowledge necessary to comprehend a text’s meaning. Although U.S. schools have made considerable progress in teaching skills-based reading competencies that are the focus of the early grades, most have made much less progress in teaching the knowledge-based competencies students need to support reading comprehension in middle and high school. These knowledge-based competencies are key sources of lasting individual differences in reading outcomes, particularly among children growing up in low-income and non-English-speaking households.

Augmenting literacy rates, Lesaux explains, will require considerable shifts in the way reading is assessed and taught in elementary and secondary schools. First, schools must conduct comprehensive reading assessments that discern learners’ (potential) sources of reading difficulties—in both skills-based and knowledge-based competencies. Second, educators must implement instructional approaches that offer promise for teaching the conceptual and knowledge-based reading competencies that are critical for academic success, particularly for academically vulnerable populations.

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Reading” is a dynamic construct —what counts as proficient varies as a function of text demands, situation, purpose of reading, and reader characteristics. Although most young children seem to acquire proficiency in early reading skills in the elementary grades, large shares of older students struggle with texts in middle school and high school. Why do children who seem to be proficient readers in third grade struggle to comprehend texts in later grades? What keeps them from being truly proficient readers in the early grades, and why do they leave elementary school with mounting reading difficulties? One answer lies in the distinction between the procedural skills necessary for reading proficiency and the conceptual skills and knowledge necessary for reading proficiency. Although most young learners have acquired the procedural skills they need to achieve success on early reading measures, they often cannot readily handle the added language and knowledge demands of the texts in middle and high school.<sup>1</sup> Another answer lies in the role of reading instruction within the overall curriculum. Although schools are often adept at teaching procedural reading skills, most are not structured to promote knowledge-based reading development, and formal reading instruction typically stops at fourth grade. Nor have schools put into place the systematic assessment practices necessary to identify the sources of difficulty for both young and adolescent readers and the supports necessary to allow teachers to address them.

To prevent seemingly competent young readers from falling behind in middle and high school, schools must strengthen reading instruction. Taking action is especially important because many of these struggling adolescent students make up a significant

part of a growing population in today’s classrooms: students from low-income and non-English-speaking households.<sup>2</sup> To better support these populations, schools should make more effective use of the distinction between skills-based and knowledge-based competencies in designing both assessment and instructional practices.

In this article I focus on the conceptual skills and knowledge that are needed to develop the literacy skills described by Richard Murnane, Isabel Sawhill, and Catherine Snow in the article that opens this issue.<sup>3</sup> I explore why large numbers of children raised in low-income households or in families whose primary language is not English, or both, find it difficult to acquire the requisite conceptual skills and knowledge to succeed in school. I also clarify why instructional approaches that are effective in teaching reading skills to meet literacy demands in the early elementary grades are not necessarily effective for reading in middle school, as well as why improved test scores in the early grades over the past twenty years mask serious deficits that ultimately impede academic achievement.

## The Demographics of Reading Difficulties

According to census data an increasing number of students entering U.S. schools come from low socioeconomic or immigrant backgrounds, or both, that predict an at-risk profile for reading difficulties. The latest government statistics reveal that child poverty rates increased from 16.2 percent in 2000 to 21.6 percent in 2010.<sup>4</sup> With immigration rates also on the rise, children of immigrants now make up 24 percent of the school-age population. The Latino population, the nation’s largest immigrant group, has accounted for 56 percent of U.S. population growth in the



past two decades, and U.S.-born children of Latino immigrants are the fastest-growing school-age population entering preschools and kindergartens.<sup>5</sup> Moreover, linguistic diversity and poverty are related; many children of immigrants and immigrant children are raised in poverty. Strikingly, approximately one in every three Latino children grows up in poverty, and many also enter school with limited proficiency in English.<sup>6</sup>

Poverty's negative effects on reading outcomes—the result primarily of disparate learning opportunities afforded to children growing up in higher and lower income settings—place this population at significant risk of school failure.<sup>7</sup> Similarly, having to learn to read and develop academic knowledge in a language in which they are not fully proficient increases the likelihood of school failure for students from non-English-speaking households.<sup>8</sup> Second-language learners who grow up in poverty thus face compounding risks, making them especially vulnerable to poor academic outcomes.<sup>9</sup>

Large-scale assessment results confirm the troubling demographics of reading difficulties in the United States. According to the 2009 National Assessment of Educational Progress (NAEP) results, only 6 percent of students classified as English Language Learners in grade four and 3 percent in grade eight read at or above proficiency levels.<sup>10</sup> Of students raised in poverty (as determined by qualification for free or reduced-priced lunch), only 17 percent in fourth grade and 16 percent in eighth grade read at or above proficiency levels. And as the share of students from these vulnerable populations grows nationwide, the number of students with reading difficulties is also likely to rise, particularly at the secondary level where texts are more sophisticated and reading demands are high.<sup>11</sup>

Faced with these pervasively low literacy performance rates and a test-based accountability system that demands scrutiny of student outcomes by demographic background (including poverty and second-language learner status), federal, state, and district-level leaders are pushing hard for instructional change. In rural and urban settings characterized by poverty or linguistic diversity, or both, administrators are working to improve the overall quality of literacy instruction and the design of learning environments.<sup>12</sup> Many schools, however, especially those in states where immigration is a relatively recent phenomenon, are ill-equipped to serve their growing numbers of children from non-English-speaking homes.<sup>13</sup> What were once questions from individual teachers worrying about the individual student with limited proficiency in English—part of a relatively small group of struggling readers—are now much larger-scale questions posed by policy makers and practitioners alike about how to bolster literacy rates among this population.

### **Skills-Based and Knowledge-Based Reading Competencies**

As noted, becoming an effective reader is a dynamic and complex process. “Reading” at age three is not the same as reading at age five; reading for a nine-year-old is different from reading for a college student. Maturing readers need to keep pace with the changing demands of text and the purpose for reading. To read effectively, readers not only decipher words on a page, but also use accumulating knowledge to assess, evaluate, and synthesize the presented information.<sup>14</sup> When reading successfully, readers often work in shades of gray, confronting problems that can be solved only by integrating ideas from multiple resources; they understand a wide range of concepts and access and apply knowledge from multiple disciplines. In this way, reading

creates a foundation for learning across all academic domains, including math, science, and social studies.<sup>15</sup>

The distinction between the procedural skills and the conceptual skills and knowledge necessary for reading proficiency is important for thinking about reading instruction as it relates to children from low-income and non-English-speaking homes.<sup>16</sup> To better support these children, the distinction should inform the design of both assessment and instructional practices in order to target both the smaller (skills) and larger (knowledge) reading problem spaces.

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Skills-based competencies are those that allow students to master the mechanics of reading. They are highly susceptible to instruction, are learned in the primary grades by the average student, and for the great majority of students are not a lasting source of difficulty.<sup>17</sup> These skills relate mostly to the “mechanics” of reading—the ability to map the letters onto their respective sounds in combinations, and thus read words. For example, knowing the full array of sound-symbol relations using the twenty-six letters and forty-four sounds in the English language enables accurate word reading.

Knowledge-based competencies, by contrast, must be developed over many years and are key sources of lasting individual differences in reading ability.<sup>18</sup> At a minimum, to make meaning from text, the reader needs relevant background knowledge related to the text's vocabulary, topic, and structure.<sup>19</sup> The passage below, adapted from a common fifth-grade reading assessment, illustrates the distinction between skills-based and knowledge-based competencies in reading.<sup>20</sup>

### **High-Speed Trains**

A type of high-speed train was first introduced in Japan about forty years ago. The train is low to the ground, and its nose looks somewhat like the nose of a jet. These trains provided the first passenger service that moved at a speed of one hundred miles per hour. Today, they are even faster, traveling at speeds of almost two hundred miles per hour. There are many reasons that high-speed trains are popular.

Students must demonstrate both types of reading competencies to read even this short passage. They must be able to map sounds onto letters (for example, /s/ /p/ /ee/ /d/) and blend these to form a word. They must also recognize common spelling patterns, such as the “-igh” family found in the word “high.” And students must do this decoding fast enough to have time to attend to meaning; in fifth grade, they must read correctly at least 115 words a minute. But skills-based competencies are not sufficient to support text comprehension. Students also need knowledge-based competencies, including understanding the meaning of the words in their contexts and other relevant language skills. In this example, the multiplicity of possible meanings of the word “service” makes this task especially challenging. (Dictionary.com provides thirty-seven entries under the word “service,” including noun, adjective, and

verb forms, along with a number of idioms.) Students must also activate and use relevant background knowledge, bringing some conceptual knowledge about both trains and jets, for instance, to fully understand the passage. Moreover, students must have the interest and motivation to finish the passage and the cognitive strategies necessary to monitor their reading and repair any misunderstandings along the way (for example, a child who pictures a human nose upon coming to the word “nose” in the text must adjust this misunderstanding when reading the comparison to a jet nose).

### **Reading Development for Children from Non-English-Speaking and Low-Income Households**

Developmental research makes clear that the vast majority of children from non-English-speaking and low-income households ably master procedural skills-based reading competencies within the same time frame as their peers from middle-class, majority-culture backgrounds.<sup>21</sup> That is, with adequate instruction, the great majority of the school-age population is proficient in letter-sound correspondences—and thus has the basic ability to decode printed words—by the end of second grade.<sup>22</sup>

By contrast, knowledge-based competencies—those competencies more directly related to comprehension—appear to be persistent sources of difficulty for many of these students.<sup>23</sup> This trend surfaces in cross-sectional data featuring results from large-scale reading assessments, such as the NAEP (see statistics above) and state-level tests, though few studies have examined the skills that determine performance on these measures. A recent wave of developmental research, however, confirms the challenges for the growing population of children who

enter school with limited proficiency in English.<sup>24</sup> For example, across three studies (two of which are longitudinal studies, each following a cohort of children over time) of U.S.-born children of Latino immigrants conducted in the Southwest and in the Northeast, the average reading comprehension level hovered around the 30th percentile by the end of middle school. For the samples in both regions, mechanical skills were within the average range, while vocabulary levels—often considered a proxy for background knowledge—were between the 20th and 30th percentile.<sup>25</sup>

Yet the challenges of limited English proficiency are not always clear. In the United States, many children who are learning English as a second language also live in low-income households, which have long been identified as risk factors for later reading achievement.<sup>26</sup>

Emerging work using a comparative design demonstrates the role of poverty in reading difficulties, noting the similar literacy outcomes for children from low-income households, irrespective of language background. For example, a recent study examined the nature of reading comprehension difficulties for struggling sixth-grade readers enrolled in twenty-six classrooms in a large, urban district. When comparing the sources of difficulty for those struggling readers from non-English-speaking homes and those from monolingual English-speaking homes, the researchers found more similarities than differences. For the sample studied, low vocabulary knowledge was a profound source of difficulty across linguistic groups, while the majority of these struggling readers had developed age-appropriate skills-based reading competencies.<sup>27</sup>

Another study, by Michael Kieffer, using the nationally representative Early Childhood Longitudinal Study, Kindergarten Cohort, data set, showed that children who entered kindergarten with limited proficiency in English continued to demonstrate reading achievement below that of their monolingual English-speaking peers through fifth grade.<sup>28</sup> The kindergarten students from non-English-speaking homes, however, had scores similar to those of monolingual English speakers from homes at comparable socioeconomic levels. Moreover, an in-depth comparison of adolescent nonnative English speakers (who were U.S.-born and educated) and their native English-speaking classmates demonstrated that both groups knew key elements of features of text known to influence comprehension, but that both performed relatively poorly on measures of language and vocabulary.<sup>29</sup> Although the nonnative speakers performed worse than the native speakers, whether these differences were practically meaningful—for the purposes of improvement efforts—is in question.

These findings suggest that many students who enter school with limited English proficiency or with low scores on early literacy or “reading readiness” measures, or both, never “catch up.” Many educators are left with the impression that negotiating two languages may compromise overall learning ability. In fact, although their reading performance levels appear low, performance growth rates for these vulnerable populations are promising. For example, a ten-year longitudinal study following Spanish-speaking children (U.S.-born children of immigrants recruited from Head Start centers at age four) from early childhood through early adolescence finds that both skills-based and knowledge-based reading competencies grew at a rate equivalent to that of the average U.S. monolingual

English student.<sup>30</sup> Kieffer’s research using the Early Childhood Longitudinal Study, Kindergarten Cohort, similarly suggests that children who entered kindergarten with lower proficiency in English than their monolingual peers had significantly lower scores in fifth grade even though they had slightly faster rates of growth in reading.<sup>31</sup> Taken together, these studies suggest that although children entering school with limited English proficiency demonstrate age-appropriate, even relatively rapid, growth in English reading achievement from early childhood through early adolescence, the growth is not sufficient to compensate for the substantial early gaps.

### Implications for Assessment

Assessment is the cornerstone of effective teaching practice; the degree to which teachers are comprehensive and timely in supporting struggling readers varies as a function of whether they are comprehensive and timely in assessing reading competencies. Indeed, good reading instruction starts with comprehensive assessment.<sup>32</sup>

Key insights into the dynamic, multifaceted nature of reading and the struggle of students from low-income and non-English-speaking homes to develop adequate knowledge-based reading competencies to support comprehension should guide reading assessment practices for both early readers and adolescent readers.

For early readers, comprehensive screening is essential. To a large extent, educators have the ability to determine which young students will have problems reading advanced texts in later grades. In fact, research shows that it is possible to predict in early childhood who is at risk for later reading difficulties. For example, just as a child’s ability to hear

and work with the sounds of spoken language (called “phonological awareness”) at ages four and five is strongly related to his word reading skills in the primary grades,<sup>33</sup> a child’s vocabulary at age four is predictive of his third-grade reading comprehension.<sup>34</sup> Yet in many districts and schools the first reading assessment is the standards-based test administered in third or fourth grade.

Even when early reading screening batteries are in place, they focus overwhelmingly on skills-based reading competencies (testing such skills as letter knowledge, word reading accuracy, and word reading fluency) and not on knowledge-based competencies.

Measuring children’s progress in reading on the basis of skills-based reading competencies alone, however, can mask significant weaknesses in knowledge-based competencies that directly support later text comprehension, especially in vulnerable populations of children.<sup>35</sup> Early reading instruction too is unbalanced. During the only years when large blocks of time are devoted to reading instruction, schools often devote disproportionate instructional time, planning, and professional development to increasing students’ skills-based competencies in a systematic, explicit manner. Thus, comprehensive early reading screening batteries must capture and monitor children’s progress in both skills-based and knowledge-based reading competencies.<sup>36</sup> Advances in e-reading technology highlight the potential of new assessment batteries that are targeted to individual students’ developmental needs and that include measures of knowledge-based competencies. (See the article by Gina Biancarosa and Gina Griffiths in this issue.)<sup>37</sup> Using early assessments that include these knowledge-based competencies, teachers can match instruction to the developmental needs of readers by focusing attention on other competencies necessary for later

reading success. Until all schools consistently perform such screening batteries, many of the nation’s most vulnerable readers will have to struggle for years because no one has identified their significant weaknesses in understanding text. By that point, a cycle of academic failure (and its ripple effects) is entrenched; years of opportunities for intervention and support have been squandered, and reading problems may have caused great harm to a child’s school experience and identity.

For adolescents, comprehensive reading assessment would also contribute to improvement efforts by shedding light on struggling readers’ specific sources of difficulty throughout the secondary years. Although reading intervention in the primary grades tends to be based on a child’s profile on measures of component competencies of reading (albeit often skills-based reading competencies), the struggling adolescent reader is most often identified for services based on performance on a singular, global measure of reading (for example, a state test). No further assessment to investigate sources of difficulty is undertaken.<sup>38</sup> In turn, interventions used with (often heterogeneous) groups of “struggling readers” tend to be driven by the availability of commercial supplemental programs.<sup>39</sup> These interventions also gravitate toward skills-based competencies. Many focus on word reading fluency, for example, when it is clear that many struggling middle and high school readers need to develop the vocabulary and background knowledge necessary to comprehend grade-level academic texts.

As such, in middle and high schools, the dearth of comprehensive diagnostic assessment, coupled with current intervention selection practices, results in a mismatch between struggling readers’ needs and the



instructional supports that might be offered to them.<sup>40</sup> Reading assessment should do far more than identify whether a child is reading at grade level; it should identify weaknesses in specific competencies that may result in later difficulties. The assessment should also reveal strengths and weaknesses across groups of students—by grade level and by competency. Particularly in secondary schools serving vulnerable populations, ongoing comprehensive reading assessments must uncover students' instructional needs, inform classroom instruction, and support intensified instruction for those in need.

### Implications for Instruction

As demographics of the U.S. school-age population shift and twenty-first-century literacy demands raise the proficiency bar for what it means to be “literate,” large percentages of students need more targeted literacy instruction and intervention efforts. Now is the time to revisit some of the principles that guide the current paradigm for reading instruction throughout the school years in order to better prepare all readers as they navigate through elementary and secondary school.

Just as the nation's schools need a more comprehensive approach to the assessment of reading, they need a more comprehensive approach to its instruction—one that better capitalizes on identified strengths and targets student needs in the service of text comprehension. This shift will require two major changes.

First, reading must be conceptualized in practice as it is in theory and research—as a developmental, dynamic process that depends heavily on knowledge-based reading competencies. Large-scale observational research conducted in high-poverty, linguistically diverse elementary schools suggests that

systematic instruction focused on knowledge-based competencies in these settings is limited.<sup>41</sup> Yet without well-developed abilities in meaning-related competencies, mastery of the mechanics of reading becomes less and less valuable with time. Indeed, the core benefit of mastering the mechanics of print is to allow students to direct and devote sufficient cognitive resources to the meaning-making process.<sup>42</sup> Without a significant grasp of the knowledge-based competencies, vulnerable populations of students reach middle school with serious reading problems. For example, comprehension strategies often taught as part of today's standard instruction—predicting, summarizing, making inferences—can be leveraged only if the student has the relevant vocabulary and background knowledge needed for the passage.<sup>43</sup>

Second, the importance of knowledge-based reading competencies, as well as the increasing demands of text in secondary school, warrant policies that call for reading instruction as a pre-K-to-12 enterprise, rather than a K–3 practice. Given the changing (and increasing) language and knowledge demands of text, even a comprehensive K–3 approach to reading instruction will leave many at-risk readers struggling with the sophisticated texts they encounter as they move through the school years. A pre-K-to-12 instructional model would be guided by a cohesive plan to provide reading instruction year after year, with an eye toward supporting all students, but especially those who are academically vulnerable.

With these two shifts in mind, what should the new instructional model look like? It would provide students with deep, language- and content-based instruction, with a focus on teaching both specialized vocabulary (and the often-abstract concepts such words represent) and the specialized structures

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of language in academic speech and text—often referred to as elements of “academic language.” Such language is an essential tool for reading, writing, and critical thinking, one that presents a particular source of difficulty for many students; its instruction is gaining momentum but is only just beginning to amass empirical support for bolstering language ability, reading comprehension levels, and content area knowledge.<sup>44</sup> Most often, as implemented, academic language instruction uses text (the medium that is challenging for these learners) as its platform, anchoring the work in rich content for study. It also uses a sustained focus on written language (for example, developing extended research pieces and essays) and oral language (for example, using discussions and debates)—practices largely absent from elementary and secondary classrooms.<sup>45</sup> In these purposeful language-rich environments, students have access not only to texts, but also to collaborative experiences such as labs, demonstrations, and debates that promote academic conversation and knowledge building.<sup>46</sup> These activities appear to be especially important for students whose home and community

language is different from the academic language used in texts, assessments, postsecondary classrooms, and the workplace. Rigorous research that conforms to standards of best evidence is just beginning to investigate the effects of such an instructional approach on student outcomes.<sup>47</sup>

Promoting language-based reading instruction requires some caution, however, because some educators and education leaders may interpret student data and needs and respond with a plan for “vocabulary instruction” that is too simplistic to address the problem meaningfully. Attending to the inherently complex instructional challenge of building up at-risk students’ background knowledge and academic language by adding word lists or spending a short time each day dedicated to “word study” falls far short of a true understanding of, or genuine response to, the problem.

Finally, coordinating language- and content-rich settings in all school buildings demands leaders who understand literacy and reading instruction. Although reading instruction has typically been an individual enterprise in the K–3 classroom—a task led by the teacher and relegated to one particular instructional block—it must become a more collaborative effort.<sup>48</sup> In the new instructional paradigm, principals would create a cohesive environment for building language and knowledge by ensuring ongoing professional development and providing time and space for collaborative efforts between classroom teachers from across content areas and resource staff.

## **Next Steps and Implications for Research**

The challenge is to accelerate academic growth for students who show academic strength in word reading but are not



amassing the vocabulary and knowledge base they need for reading and academic success. By strengthening the language environments that are part of the everyday school experiences of students from non-English-speaking or low-income homes, educators can support children as they develop the knowledge-based competencies needed to access academic texts. Paying greater attention to sustained, comprehensive, and deep instruction, and using assessments that capture complex thinking and learning, will enable teachers to begin augmenting students' knowledge with the competencies that are crucial to this population's success in school.

Many system-level issues remain. For example, improved theories of reading comprehension for these at-risk populations can inform both assessment and instruction—beginning with the delineation of skills-based and knowledge-based reading competencies. The complexities of reading and the heightened demands that sophisticated texts make on students call for research on the socio-emotional characteristics and higher-order cognitive abilities that guide self-regulation, planning, and complex thought.<sup>49</sup> Both policy makers and practitioners would benefit from research that continues to develop and test approaches for pre-K-to-12 content-based literacy instruction focusing on the language

of text. Math, science, and history teachers at all levels, for example, would benefit from guidance on how to support students who are struggling to understand their course texts and other written materials.

For maximum effect, the effort to improve the learning environment should encompass both instruction (programs and curricula) and foundational school and classroom processes. For programmatic changes to take hold, researchers should examine how conditions in schools and in classrooms can sustain improvements. One study, for example, used a global, standardized measure of teachers' speech to investigate the quality of the classroom language environment. The study found that in the middle school English Language Arts classroom (one of several classes a student attends each day), the quality of teachers' speech can have effects on student reading achievement over the course of an academic year that are comparable to the effects found in intervention studies.<sup>50</sup> More research on how classroom conditions may lead to improvement is needed. Especially valuable would be studies that identify the types of teacher training and development that can help teachers create the language-rich environment needed to bolster the reading achievement of vulnerable populations.

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# Adolescent Literacy: Learning and Understanding Content

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*Susan R. Goldman*

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## Summary

Learning to read—amazing as it is to small children and their parents—is one thing. Reading to learn, explains Susan Goldman of the University of Illinois at Chicago, is quite another. Are today’s students able to use reading and writing to acquire knowledge, solve problems, and make decisions in academic, personal, and professional arenas? Do they have the literacy skills necessary to meet the demands of the twenty-first century? To answer these questions, Goldman describes the increasingly complex comprehension, reasoning skills, and knowledge that students need as they progress through school and surveys what researchers and educators know about how to teach those skills.

Successfully reading to learn requires the ability to analyze, synthesize, and evaluate information from multiple sources, Goldman writes. Effective readers must be able to apply different knowledge, reading, and reasoning processes to different types of content, from fiction to history and science, to news accounts and user manuals. They must assess sources of information for relevance, reliability, impartiality, and completeness. And they must connect information across multiple sources. In short, successful readers must not only use general reading skills but also pay close attention to discipline-specific processes.

Goldman reviews the evidence on three different instructional approaches to reading to learn: general comprehension strategies, classroom discussion, and disciplinary content instruction. She argues that building the literacy skills necessary for U.S. students to read comprehensively and critically and to learn content in a variety of disciplines should be a primary responsibility for all of the nation’s teachers. But outside of English, few subject-area teachers are aware of the need to teach subject-area reading comprehension skills, nor have they had opportunities to learn them themselves. Building the capacity of all teachers to meet the literacy needs of today’s students requires long-term investment and commitment from the education community as well as society as a whole.

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The nation's educational system is turning out readers who are ill-prepared for the literacy demands of the twenty-first century. The most recent National Assessment of Educational Progress report indicates that almost one-third of U.S. students do not achieve basic levels of reading competency by fourth grade.<sup>1</sup> Equally alarming, high school students' reading performance shows no improvement from 1971, with only 38 percent of high school seniors scoring at or above proficient.<sup>2</sup> Indeed, estimates are that 90 million U.S. adults lack adequate literacy, with many unable to take care of their health needs, let alone participate in the contemporary workforce.<sup>3</sup> And the literacy skills needed for the twenty-first century have themselves increased. To be literate today means being able to use reading and writing to acquire knowledge, solve problems, and make decisions in academic, personal, and professional arenas.

Twenty-first-century literacy poses four major challenges for students and their teachers. First, successful readers must learn how to move beyond what text says to what text means. Successful learning, problem solving, and decision making at school, at work, and in personal situations rely on analysis, synthesis, and evaluation of information from multiple sources of traditional text as well as expanded conceptions of text that include multimodal information sources.<sup>4</sup> Second, effective readers must be able to apply reading and interpretation skills differently depending on subject matter, using different knowledge, reading, and reasoning processes to interpret *Macbeth*, analyze the causes of the Vietnam War, or explain the advantages of compact fluorescent bulbs over incandescent ones.<sup>5</sup> Third, ongoing advances in information technology make it

necessary for readers to be able to navigate vastly increased amounts of information, both traditional print-based texts and multimodal forms including complex visuals and animations.<sup>6</sup> Moreover, because the World Wide Web lacks traditional controls on the quality of that information, readers and users must know how to evaluate sites and sources for relevance, reliability, level of complexity, impartiality, and completeness.<sup>7</sup> Some argue that the web has introduced "new" literacies.<sup>8</sup> In fact, by spotlighting the centrality of inquiry and problem solving to twenty-first-century literacy, the web has raised the bar on what it means to be literate.<sup>9</sup> Fourth, to analyze, synthesize, and integrate disparate material, readers must be able to connect information across multiple sources and evaluate whether the different sources are consistent. Successful readers must adopt an active, critical, questioning stance while reading.<sup>10</sup> In so doing they not only use general reading skills but also pay close attention to discipline-specific content, reasoning, and knowledge-production processes.

As yet, only a meager body of research-based evidence speaks directly to the teaching and learning challenges posed by these literacy demands. Much of what researchers and educators know about successful reading comprehension comes from small-scale laboratory- or classroom-based research (ranging from one or two teachers to twenty or thirty for each instructional intervention) on comprehension instruction, including vocabulary development. Research related to disciplinary literacies and the use of online resources is just emerging. As might be expected for an emerging research area, more of this work is descriptive than experimental, but it is nevertheless instructive. In this article I focus on what is known about reading to learn content,

the core educational task from fourth grade through high school. I describe what reading to learn content entails, the kinds of knowledge and conceptual skills it requires, and three broad types of instructional approaches aimed at helping students acquire and gain proficiency at reading to learn. I also discuss what teachers need to know to support students in reading to learn.

## **Beyond Learning to Read**

Jeanne Chall pointed out thirty years ago the sharp distinction between learning to read and reading to learn.<sup>11</sup> Learning to read involves mastering basic procedural reading skills that enable readers to recognize written words, pronounce them correctly, and read with reasonable fluency (see the articles in this issue by Nell Duke and Meghan Block and by Nonie Lesaux).<sup>12</sup> Reading to learn involves moving beyond these procedural reading skills to acquire information from text.<sup>13</sup> Chall emphasized that many students do not automatically make the transition from learning to read to reading to learn. Such students need specific instruction as they move through school to master more complex texts and new comprehension tasks. Until students reach fourth grade, teachers focus most of their effort on helping them learn to read. Thereafter, if students are to understand how to read to learn history, math, science, and literature, much of reading instruction must take place in content-area classes.

That the different disciplines have differentiated literacy practices has been recognized explicitly by the Common Core State Standards for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects, developed in 2010 by the Council of Chief State School Officers and the National Governors Association and adopted voluntarily by nearly all the states.<sup>14</sup>

The reading and writing standards, specifically Standards 7, 8, and 9 for each of these disciplines, include integration of knowledge and ideas from multiple texts, along with considerations of the quality of the claims and evidence in them. Table 1 provides descriptions of Standards 7, 8, and 9 for the Common Core standards at each of three grade bands. Two aspects of these descriptors are especially notable. First, within a content area, the complexity of the task increases. For example, in literature, seventh graders compare and contrast a literary piece in its traditional print form with an audio or video version; in grades nine and ten, students analyze the impact of the medium on interpretation; finally in grades eleven and twelve, students analyze multiple interpretations of the same work across several media forms. Second, the descriptions of the standards differ depending on whether the content area is literature, history and social studies, or science and technical subjects. For example, Standard 8—evaluate the argument in a text—is not applicable to literature; in history and science the descriptors are similar until grades eleven and twelve. For Standard 9, the descriptors reflect the differences in the nature of reasoning and evidence across the disciplines. Furthermore, although the table does not show this point, students are expected to apply these skills to texts of increasing complexity and more varied genres as they progress from grade four through grade twelve (Standard 10).

Impressive though they are in raising the literacy bar, the standards will not by themselves change the practices of content-area teachers, whose teacher preparation has, for the most part, focused on content rather than on the literacy practices of the content area. At the same time, many adolescents have not adequately mastered the procedural literacy

Table 1. Standards 7, 8, and 9 from the Common Core State Standards for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects

Reading standards for literature	Reading standards for literacy in history and social studies	Reading standards for literacy in science and technical subjects
Standard 7: Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.		
Grade 7*: Compare and contrast a written story, drama, or poem to its audio, filmed, staged, or multimedia version, analyzing the effects of techniques unique to each medium (for example, lighting, sound, color, or camera focus and angles in a film).	Grades 6–8: Integrate visual information (for example, in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.	Grades 6–8: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (for example, in flowchart, diagram, model, graph, or table).
Grades 9–10: Analyze the representation of a subject or a key scene in two different artistic mediums, including what is emphasized or absent in each treatment (for example, Auden’s “Musée des Beaux Arts” and Bruegel’s <i>Landscape with the Fall of Icarus</i> ).	Grades 9–10: Integrate quantitative or technical analysis (for example, charts, research data) with qualitative analysis in print or digital text.	Grades 9–10: Translate quantitative or technical information expressed in words in a text into visual form (for example, a table or chart) and translate information expressed visually or mathematically (for example, in an equation) into words.
Grades 11–12: Analyze multiple interpretations of a story, drama, or poem (for example, recorded or live production of a play or recorded novel or poetry), evaluating how each version interprets the source text. (Include at least one play by Shakespeare and one play by an American dramatist.)	Grades 11–12: Integrate and evaluate multiple sources of information presented in diverse formats and media (for example, visually, quantitatively, as well as in words) in order to address a question or solve a problem.	Grades 11–12: Integrate and evaluate multiple sources of information presented in diverse formats and media (for example, quantitative data, video, multimedia) in order to address a question or solve a problem.
Standard 8: Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.		
Grades 6–8: Not applicable to literature	Grades 6–8: Distinguish among fact, opinion and reasoned judgment in a text.	Grades 6–8: Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
Grades 9–10: Not applicable to literature	Grade 9–10: Assess the extent to which the reasoning and evidence in a text support the author’s claims.	Grade 9–10: Assess the extent to which the reasoning and evidence in a text support the author’s claims or a recommendation for solving a scientific or technical problem.
Grades 11–12: Not applicable to literature	Grade 11–12: Evaluate an author’s premises, claims, and evidence by corroborating or challenging them with other information.	Grades 11–12: Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.		
Grade 7: Compare and contrast a fictional portrayal of a time, place, or character and a historical account of the same period as a means of understanding how authors of fiction use or alter history.	Grade 6–8: Analyze the relationship between a primary and a secondary source on the same topic.	Grades 6–8: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
Grades 9–10: Analyze how an author draws on and transforms source material in a specific work (for example, how Shakespeare treats a theme or topic from Ovid or the Bible or how a later author draws on a play by Shakespeare).	Grades 9–10: Compare and contrast treatments of the same topic in several primary and secondary sources.	Grades 9–10: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
Grades 11–12: Demonstrate knowledge of 18th-, 19th-, and early 20th-century foundational works of American literature, including how two or more texts from the same period treat similar themes or topics.	Grades 11–12: Integrate information from diverse sources, both primary and secondary, into a coherent understanding of an idea or event, noting discrepancies among sources.	Grades 11–12: Synthesize information from a range of sources (for example, texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Source: Council of Chief State School Officers. “The Common Core Standards for English Language Arts and Literacy in History/Social Studies and Science and Technical Subjects” (2010) ([www.corestandards.org](http://www.corestandards.org)), pp. 36–38; 61–62.

\*Literature Standard 7 is separately described for each of grades 6, 7, and 8. I reproduced grade 7 here.

skills of the early grades, and even those who have mastered them are often ill-equipped to confront the comprehension challenges of content-area texts.<sup>15</sup> Middle grades and high school teachers' primary responsibility has been to teach the content, de-emphasizing the literacy practices central to comprehending the content and thereby increasing the struggles of students who may not have learned to read adequately in the lower grades.<sup>16</sup> The tension inherent in this situation is exacerbated by the meager resources (curricular supports or assessments) available to guide content-area teachers with what should be their dual emphasis—teaching disciplinary content and disciplinary literacy.

Because U.S. adolescents have few opportunities to be taught advanced reading comprehension, their lack of progress on national assessments should not be surprising.<sup>17</sup> Nevertheless, some students do successfully read to learn. In the next section I briefly review research characterizing the reading skills of successful students in order to identify the conceptual skills and knowledge that all readers need.

## **Successful Comprehension and Reading to Learn**

Much research on comprehension has focused on students who are reading to learn from single texts.<sup>18</sup> The research identifies five characteristics of successful readers; all five involve active engagement. First, those who are successfully reading to learn monitor their comprehension and use a range of strategies when they realize they do not understand what they are reading.<sup>19</sup> Second, successful readers are able to explain concepts in the text and relate different concepts within a text to each other and to relevant knowledge they have already acquired.<sup>20</sup> Third, they

often generate self-explanations during reading,<sup>21</sup> ask questions that probe the connections among parts of the text, or seek explanations.<sup>22</sup> Fourth, they use cues to the logical organization of a text to guide their comprehension.<sup>23</sup> And, finally, they rely on multiple types of knowledge (for example, knowledge of words, concepts, sentence structures, text structures, genres) as they try to interpret print. By contrast, students who are weak at comprehension tend to restate or paraphrase texts, substituting synonyms or reordering the words, rather than explaining. Any connections these readers make or questions they ask tend to be superficial.<sup>24</sup>

Researchers have learned about successful multiple-source comprehension from investigating how specialists read in specific academic disciplines. Literary experts reading poetry and prose relate what they are reading to other works by the same author and from the same period. They are sensitive to multiple interpretations and explore insights into human experience afforded by the literary work.<sup>25</sup> In history and science, experts routinely engage in selection, analysis, and synthesis within and across multiple sources of evidence, yet they enact these processes differently.<sup>26</sup> Chemists, for example, spend a lot of time mapping back and forth across different representations of the same information, for example, structural notations like H<sub>2</sub>O, molecular models, words, and equations. Historians, by contrast, first look at and consider when, why, and by whom a text was created.<sup>27</sup> Interestingly, specialists reading outside their field of expertise do not display the same complex processing strategies they use within their field of expertise,<sup>28</sup> demonstrating the important role that content knowledge plays in guiding reading behavior.<sup>29</sup>



Not surprisingly, adolescent students rarely engage in the disciplinary processing strategies used by experts.<sup>30</sup> For most high school students—excepting only the few who enroll in Advanced Placement (AP) courses in history—participating in a research study may be the first time they are asked to read more than one source to address a question. In some high schools, students write “term papers” that require them to read multiple sources, but too often the results are annotated bibliographies rather than syntheses across the sources.

### Promising Instructional Approaches to Comprehension

Researchers have developed a variety of promising instructional approaches to reading to learn and have subjected them to empirical evaluation, mostly with small samples of teachers and classrooms (fewer than twenty per comparison). In some cases, the positive effects observed in these studies have been replicated across several other small-scale studies, increasing confidence in the impact of the approach. Only a few of these approaches have yielded experimental evidence of effectiveness, however.<sup>31</sup> One reason for the paucity of evidence is that effective reading-to-learn instruction has many moving parts: teaching several different instructional strategies; teaching how to use those strategies flexibly depending on task, text, and learning goals; ensuring engagement; and introducing opportunities for interacting with peers and teachers about the text.<sup>32</sup>

In the following sections I review research on three different approaches to teaching comprehension. The first is strategy-based instruction of single or multiple strategies. The second is discussion-based instruction. The third is disciplinary content-based instruction. In reality, all three approaches

are likely to be needed in a successful reading-to-learn instructional program.

### Strategy-Based Instruction

By far the most common approach to teaching comprehension is to focus explicitly on teaching strategies to aid comprehension. The strategy-based approach has had positive effects in experimental studies and was the only approach sanctioned in the report issued by the National Reading Panel, a group of experts in reading that was convened by the National Institutes of Health.<sup>33</sup>

The bulk of research on strategy-based instruction has focused on text-processing strategies and on making students more aware of the text *per se*, including vocabulary, cues to logical organization (for example, paragraphing, connector words such as *therefore*, *because*, *as a result*), as well as their own monitoring of points in need of clarification, and questions about the text. Initially strategy-based training focused on teaching individual strategies, but research revealed that the effects of single-strategy training tended to be limited to the particular strategy itself with little impact on reading comprehension more generally.<sup>34</sup> That discovery contributed to a shift toward interventions that focused on multiple strategies and their coordination. One of the earliest multiple-strategy interventions, Reciprocal Teaching, teaches four strategies for processing text, both narrative and expository: clarification, questioning, summarization, and predicting.<sup>35</sup> Reciprocal Teaching is a small-group intervention designed to be managed by students after it is introduced through teacher modeling. Students monitor their reading to make sure they understand the meaning of the text (clarification), ask any questions they have about the content, summarize the content, and predict what will be next in

the text. In an extensive review of research on the effectiveness of Reciprocal Teaching with elementary and middle school students, Barak Rosenshine and Carla Meister concluded that the intervention had positive and robust effects on reading comprehension performance on standardized tests.<sup>36</sup> Another multiple-strategy intervention, Students Achieving Independent Learning (SAIL), has also been found effective.<sup>37</sup> SAIL focuses on the coordinated use of strategies that are characteristic of successful readers and includes many of the same strategies used in Reciprocal Teaching. It adds an emphasis on understanding when and why particular strategies are useful.

Summarization, one of the strategies in Reciprocal Teaching and SAIL, actually involves using multiple strategies, especially when applied to lengthy texts and text sets. A good summary demonstrates understanding of the gist or main ideas of the text, selects only content that is important and relevant to the purpose or task for which the reading is being done, and is sufficiently detailed to preserve the flow of ideas. The challenge for readers with limited knowledge of the content of the text is that everything is unfamiliar and seems important, making it difficult to selectively include information in the summary.

Summary Street is a web-based intervention that targets students' summarization skills by providing guided practice in writing summaries for passages.<sup>38</sup> Summary Street gives students feedback on the content of their summaries and asks them to decide how to adjust the summaries. The feedback uses a back-end computational process that determines similarity between the student's summary and the text being summarized. The heuristics used to evaluate the written summaries favor those that use the reader's own words, contain few redundancies, include the

important main ideas, and are appropriate in length.<sup>39</sup> The feedback provides suggestions for improving the summary (for example, include more from paragraph two, less from paragraph one). Students then decide how to improve their summaries, resubmit them, and receive feedback on the new summary.

Revision continues until the summary reaches predetermined coverage and length constraints. Summary Street's feedback practices are consistent with those recommended by studies of tutors and tutoring, which suggest that feedback is most useful when it gives the user some responsibility for determining what to do next.<sup>40</sup>

A group of researchers including Donna Caccamise, Walter and Eileen Kintsch, and colleagues tested Summary Street with sixth-through ninth-grade students from a variety of socioeconomic backgrounds across the state of Colorado. They found that students' summaries of history and science texts showed significant improvement in content coverage (more relevance, less redundancy, more parts of the text included) compared with summaries written by students who did not use the program, with the size of the effect varying depending on how frequently students used the intervention.<sup>41</sup>

Structure Strategy Training, another multiple-strategy approach, teaches readers how to use paragraphing and signaling cues, such as *In summary*, *First*, *Finally*, *On the other hand*, and *The problem is*, to figure out the overall organization of the information they are reading (for example, whether the text is presenting a problem and solution or is comparing and contrasting ideas). Interventions designed to guide the attention of elementary school students to these features of text improved their reading comprehension performance.<sup>42</sup> Using a technology-based

tutor, Bonnie Meyer and several colleagues were able to adapt future lessons for students based on their performance on past lessons; the adaptive version improved reading comprehension performance on a standardized reading comprehension test more than a nonadaptive version.<sup>43</sup>

Laboratory-based studies have found that successful readers engage in explanation-based processing while those who are less successful tend to process on a superficial level, with a predominance of paraphrases and less developed explanations.<sup>44</sup> Based on these findings, Danielle McNamara and several colleagues developed an intervention, Self-Explanation Reading Training (SERT), to help students improve comprehension. SERT teaches students to engage in five different strategies, each targeting a critical aspect of the comprehension process.<sup>45</sup> The first strategy, paraphrasing, involves understanding the basic structure and meaning of the words and sentences in the text—what the text says. The second, putting it into one's own words, makes the content more familiar. The third, elaborating and predicting, asks readers to make inferences that connect what the text says to what they already know or expect based on common sense and general reasoning heuristics. The fourth, bridging, engages readers in understanding how different concepts and ideas in the text fit together. It also helps readers achieve more sentence-to-sentence connections as well as a more coherent understanding of the overall text. Finally, comprehension monitoring orients readers to thinking about what they do and do not understand and to using the other strategies to repair problems they detect. SERT uses explicit, direct instruction to tell students the purpose and function of the different kinds of processing strategies. In tests with high school students reading

science texts, SERT training produced promising results.<sup>46</sup> The intervention has now been extended into a computer-based automated intelligent tutoring system, iSTART (Interactive Strategy Trainer for Active Reading and Thinking) and is undergoing testing (see the article in this issue by Gina Biancarosa and Gina Griffiths for more information).<sup>47</sup>

### **Strategy-Based Instruction: Lessons Learned and Limitations**

The research evidence on strategy training supports three conclusions. First, effective strategy-based instruction involves teaching multiple strategies and ways to coordinate them. Some strategies involve explicit attention to features of texts as cues to important content and its organization. Other strategies connect pieces of information within the text. Yet other strategies build connections to readers' pre-existing content knowledge and expectations regarding additional content. Second, coordinating multiple strategies requires students to assess their successes and failures using particular strategies, whether they have achieved sufficient understanding, and what to do if they have not. Third, explicit teaching of strategies and their coordinated use is necessary for most students, especially when they are reading to learn. Students need opportunities to practice explicitly taught strategies and get feedback on their performance. Gradually, as students acquire greater skill in using and coordinating strategies, externally provided feedback becomes less necessary.

However, strategy-based instruction has clear limitations in meeting the many complex challenges in teaching reading comprehension in content areas. For one, coordinating multiple strategies is hard work. It requires that students engage with the texts, often for

sustained periods of time and multiple readings—something that many students either do not do at all or do only in cursory ways. A second challenge relates to the knowledge, or lack of knowledge, that readers bring to texts. Strategy-based comprehension instruction in grades four through twelve typically takes place in English language arts and is applied to fictional narratives. Even young readers typically have a rich supply of knowledge about many of the events and motivations that are central to fiction. They can benefit from strategies that use guided comprehension questions such as: Who are the characters? What is the setting? What happened first? What happened next? Why was she sad/mad/happy?<sup>48</sup>

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*Strategy-based instruction has clear limitations in meeting the many complex challenges in teaching reading comprehension in content areas.*

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Questions like these, however, do not apply to informational texts in science or social studies (nor, in fact, to all literary genres). Alternative comprehension strategies that are more generic in nature (find the main idea, identify the topic sentence, summarize, learn the words in boldface type) are often introduced for such texts.<sup>49</sup> These strategies can be helpful in reading textbooks because textbooks often follow conventions that match these generic strategies. For example, key vocabulary items are presented in boldface type; section headers mark new topics; and

the first sentence under the header is often a good summary of the section. Generic strategies are difficult to apply, however, to the authentic texts educators hope students are reading—newspaper articles, historical documents, research reports, editorials. These texts vary in the way information is organized and in the conventions used to signal more and less important information, and school-aged readers are not routinely taught how to process that information.<sup>50</sup> Lacking these organizational cues to importance, students do not have the tools they need to be able to evaluate whether their summary of an authentic text captures the important ideas. Generic comprehension strategies are particularly limited in helping students read the multiple text forms of variable credibility they encounter on the web.

Comprehension instruction that focuses only on generic reading strategies also falls short because comprehension itself becomes more complex and expansive as students mature and progress from grade to grade. Whereas fourth graders might be asked only to summarize or to define a new word after reading a science text, eighth graders and high school students are likely to be asked to make inferences, to identify the author's point of view, to evaluate the credibility of claims and conclusions, and to integrate information derived from several sources.<sup>51</sup> Furthermore, eighth graders are implicitly expected to engage in different comprehension practices when reading literature, math, science, and social studies—often without explicit instruction in these disciplinary practices.<sup>52</sup> For example, the role of the unexpected is quite different in literature, history, and science. In literature when unexpected events occur, they are often the point or message of the story, as in Aesop's fable *The Lion and the Mouse*.<sup>53</sup> History, by contrast, is sometimes compared

with a jigsaw puzzle with pieces missing. When new “pieces” come to light, they may not fit in expected ways. The poor fit occasions close reading and re-examination of the texts using historical reasoning strategies (who produced the piece? when? for what purpose?).<sup>54</sup> In science, when experiments or observations run counter to expectations, new experiments are conducted to replicate the findings. The result may be new models and explanatory accounts; sometimes, the unexpected results are discredited.

Furthermore, curricula in later grades assume that students have been acquiring content-area knowledge through reading, as well as other means, in the earlier grades. As students progress through school, the reading challenges become greater as the gap widens between the conceptual skills and knowledge students are assumed to bring to reading to learn and what most students actually bring to reading-to-learn tasks. As a result, some students may disengage from reading, learning, and school. To teachers in later grades, it often appears that past teachers simply failed to teach students what they needed to know. In fact, teachers in earlier grades may well have taught strategies such as summarization, but not in ways that enable students to use them in other contexts and for other types of content learning.

### **Discussion-Based Instruction: Building Content Knowledge and Literacy Practices**

The second form of reading-to-learn instruction is based on student discussion. A recent meta-analysis examined nine discussion-based interventions aimed at improving student comprehension and learning from text.<sup>55</sup> The interventions focused on varied types of text (narratives, history, science) but all shared a dialogic orientation—that

is, all used discussion to explore ideas and develop understanding.<sup>56</sup> The nine interventions are Book Club,<sup>57</sup> Collaborative Reasoning,<sup>58</sup> Instructional Conversation,<sup>59</sup> Grand Conversation,<sup>60</sup> Junior Great Books,<sup>61</sup> Literature Circles,<sup>62</sup> Paideia Seminar,<sup>63</sup> Philosophy for Children,<sup>64</sup> and Questioning the Author.<sup>65</sup>

The meta-analysis found, not surprisingly, that most of the interventions increased student talk and decreased teacher talk. Although many “were highly effective at promoting students’ literal and inferential comprehension,” relatively few were equally so “at promoting students’ critical thinking, reasoning, and argumentation about and around text.”<sup>66</sup> Effects were generally stronger in the smaller-scale, nonexperimental interventions, perhaps reflecting the difficulty of establishing good classroom discussion at larger scale. The meta-analysis was limited in several ways. Some of the instructional approaches had been evaluated in only one study, and for them it was not possible to look for effects on content knowledge. What the dialogic orientation did accomplish was to involve students more actively in articulating meaning in and around text and to enhance basic comprehension of the meaning of the text and inferences based on the text.

Classroom discussion is a key feature of another approach to teaching literature that was developed and tested by Judith Langer, Arthur Applebee, and colleagues with a relatively large sample (approximately eighty schools) of low- and high-achieving middle and high school students in English language arts classes. Langer and colleagues found that dialogic classroom discussion was significantly related to performance on tasks requiring students to adopt interpretive stances in literature.<sup>67</sup> They stressed that



discussion moves students from looking for “the point” of a story to “exploring the possible” through complex and challenging literary works.<sup>68</sup> Engaging adolescent students in these conversations requires that teachers set up classroom norms that invite students to develop their ideas, listen carefully to the ideas of others, and use multiple perspectives to enrich interpretation of literary works. Prompts for discussion are designed to move students through a series of “stances” toward text: initial understanding (for example, what images catch your attention as you read?), developing ideas and multiple perspectives (what are you noticing about the ideas?), learning from the text (what does this story help you understand about the character’s culture?), taking a critical stance (what are you noticing about the style of the text?), and going beyond (write your own story in the style of this one).

Cultural Modeling, an approach complementary to Langer’s, was developed by Carol Lee.<sup>69</sup> Its goal is to make students explicitly aware of how they are processing text. Cultural Modeling posits that many of the literary devices that students need to know to engage critically with literature are already part of their everyday repertoire. Students use satire, irony, symbolism, and other rhetorical devices all the time—but need to see how these same techniques are used by writers and thus how they are key to interpreting literature. If symbolism is central to a particular text, the designer or teacher would present a more familiar form—song lyrics, logos, advertisements—whose symbolism students already understand and have the students discuss both what the symbol means and *how they know* that it is a symbol and what it means. Consider several stanzas of a popular song by Katy Perry, “Firework.”<sup>70</sup>

*Do you ever feel like a plastic bag  
Drifting through the wind, wanting to  
start again?<sup>?</sup>  
Do you ever feel, feel so paper thin  
Like a house of cards, one blow from  
caving in?<sup>?</sup>  
Do you ever feel already buried deep?<sup>?</sup>  
Six feet under screams, but no one seems  
to hear a thing  
Do you know that there’s still a chance  
for you  
'Cause there’s a spark in you?<sup>?</sup>  
You just gotta ignite the light and let it  
shine  
Just own the night like the 4th of July  
'Cause baby, you’re a firework  
Come on, show ‘em what you’re worth  
Make ‘em go, oh, oh, oh  
As you shoot across the sky.*

The teacher might ask students what they make of the song and specifically what they think is the meaning of “you’re a firework.” Undoubtedly recognizing that Perry does not literally mean that a person is a firecracker, students would provide a range of symbolic interpretations. Discussing the song enables them to give voice to the reasoning behind their interpretations, and making their reasoning explicit allows them to apply the same thinking as they approach canonical texts. The work is enacted through classroom discussion that is initially led by teachers and then taken over by students.<sup>71</sup>

Students in mathematics and science classes have also experienced discussion-oriented interventions. Catherine O’Connor and her colleagues examined the impact of introducing a conceptually based mathematics program paired with the dialogic discourse that Langer and Lee used in their interventions. Discussion prompts were appropriate to mathematics thinking and to the upper elementary and middle school (grades four through seven) participants.<sup>72</sup> For example,



teachers encouraged students to provide multiple answers to a problem, to explain how they got the answer, and why their method worked. If different students arrived at the same answers using different methods, teachers asked why both methods worked. If students arrived at different answers, teachers asked which answers were most reasonable in terms of the mathematics. Teachers deepened the mathematics of conversations by revoicing students' contributions introducing math-appropriate language (for example, revoicing "I added four and four and four and four and four" as "So you multiplied four times five by adding four five times."). Over the course of instruction, students gradually took up these forms of mathematical reasoning. Such classroom talk—dubbed "accountable talk"—stresses that students are accountable to the subject matter and to their classmates for their thinking.<sup>73</sup> O'Connor and her colleagues found that students participating in accountable talk scored higher on standardized achievement tests of reading as well as math than students who did not engage in classroom discussions.<sup>74</sup>

Similar classroom talk has found its way into science instruction in elementary and middle school classrooms. Science-specific discourse norms emphasize practices of science argumentation: recording, measuring, and repeating trials of data collection; noticing patterns in data; reasoning about data; accepting disagreements about claims but backing up claims with data-based evidence; basing disagreements on data, not on personal opinion; accepting that the validity of an answer depends on the evidence used to support it.<sup>75</sup> Discussion-based science instruction also uses different forms of data representation, especially in middle school, as well as aids for representing arguments and clearly indicating claims, data, and the reasoning that

connects data to claims (that is, why *that* data set is evidence for *that* claim). Once these norms and routines are established, student-generated scientific argumentation advances noticeably.<sup>76</sup>

At the high school level, classroom discussion plays a key role in the Reading Apprenticeship program that integrates biology and literacy.<sup>77</sup> Students learn to annotate text (for example, by underlining key words or writing the main idea in the margin) and then to talk to each other about the text using their annotations. By making their thinking visible in the annotations, they share not only their interpretations but also the processes by which they come to these interpretations. Putting into words both interpretations and interpretive processes contributes to students' awareness of the strategies they are using and the characteristics of texts to which they are responding.

Efficacy data on discussion-based instruction are scant and difficult to obtain. Researchers and educators do not yet fully understand how classroom discussion relates to other features of effective classrooms—choice of texts and tasks, instruction in flexible use of multiple strategies, engagement, and a classroom ethos that makes students feel safe posing questions and making thinking visible. Teachers' skills in organizing and facilitating discussions are almost surely an important determinant of the efficacy of student discussion. Less clear is the "minimum" level of skilled facilitation needed for productive student discussion.

### **Disciplinary Content-Based Instruction**

To many students today, school tasks and experiences too often seem purposeless. History and science are lists of facts to be memorized, static bodies of information that

have little bearing on the present and that are encapsulated in thick textbooks with questions at the end of each chapter.

Disciplinary content instruction—the third approach to teaching comprehension—counters such student disengagement by involving adolescents in authentic literacy and disciplinary practices. Disciplinary content instruction embeds reading to learn in a “need to know” setting, where learning is authentic and directed toward solving some problem or answering some question in a content area that students are actively addressing. Reading becomes a tool for knowing. Disciplinary content instruction engages students in problems and questions typical of a particular academic discipline and in the literacy practices through which the work of the discipline is conducted and communicated.

Scientists, for example, record their data; look for patterns in the data; compare previous explanations, methods, and findings with new findings (their own and others’); and leave records of their work for other scientists to consult. Historians examine accounts of the past on the basis of when, why, by whom, and for what purpose an account was created and where different accounts agree. For them, discrepancies between accounts of the past are the “stuff” of historical argument. Literary critics engage with literary works by exploring moral and philosophical themes and dilemmas and by examining how various literary devices and forms (irony, symbolism, or short story, for example) enable an author to transcend the literal story world. Often students read simply to find out how problems are resolved; in a more interpretive mode, they may gain insight into their own behaviors and beliefs through the literary world.

Interventions designed to emphasize disciplinary content instruction and the literacy practices associated with the disciplines are beginning to demonstrate positive results. The principles guiding the design of these interventions are derived from lessons learned from strategy-based and classroom discussion-based work as well as from small-scale classroom-based research studies. These latter studies indicate that well-designed multiple-source, content-specific inquiry instruction does indeed provide students with opportunities to learn the expanded set of literacies they need in the twenty-first century. Disciplinary content instruction exposes students to processes akin to practices in which disciplinary experts engage in “doing” their own work; it also helps students link content with communication.<sup>78</sup> Evidence from empirical studies indicates a variety of positive effects on adolescents.

For example, when adolescent students construct historical narratives from information found in multiple documents, they learn to think more critically about what they read and engage more deeply with the text sources.<sup>79</sup> When elementary students engage with science content, their skills using data as evidence and making sense of multiple representations improve.<sup>80</sup> And when students twelve to fifteen years of age learn to create structured claim-plus-evidence arguments from multiple sources of scientific information, they improve their reasoning and science content knowledge.<sup>81</sup> In literature, when adolescents are made aware of interpretive processes they already use to understand texts from their everyday worlds such as rap songs and are shown how they are relevant to particular literary problems, many become more successful at interpreting complex literary works.<sup>82</sup>

Figure 1. Sample Item from Advanced Placement Biology Assessment

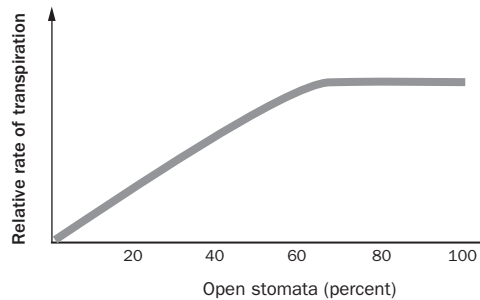
1. Plants lose water from their aboveground surfaces in the process of transpiration. Most of this water is lost from stomata, microscopic openings in the leaves. Excess water loss can have a negative effect on the growth, development, and reproduction of a plant. Severe water loss can be fatal. Environmental factors have a major impact on the rate of plant transpiration.

- Using the data at right and the axes provided, **draw** a graph showing the effect of temperature change on the rate of transpiration. **Explain** the shape of the curve from 23 degrees to 28 degrees.
- Humidity is an environmental factor that affects transpiration rate. Using the axes provided, **draw** a curve that illustrates what you predict would be the rate of transpiration with increasing humidity and constant temperature. **Justify** the shape of the curve based on your prediction.
- The curve at right illustrates the rate of transpiration related to the percent of open stomata on the leaf of a particular plant. **Explain** why the curve levels off with increasing percentage of open stomata per area of leaf.

#### Transpiration Rate Versus Temperature

Temperature (°C)	20	23	27	28
Transpiration rate (mmol/m <sup>2</sup> @ sec)	1.5	3	5	4.5

#### Open Stomata Versus Rate of Transpiration



Source: College Board, AP Biology Course and Exam Description, Effective Fall 2012 (New York: The College Board, 2012).

One important cautionary note regarding disciplinary content-based instruction is that students attempt to use their pre-existing knowledge when interpreting the content-area material. For example, they may interpret the motives of historical figures in terms of motives with which they are familiar. Linda Levstik and Keith Barton recommend using this strategy to transition third and fourth graders into the study of history.<sup>53</sup> Not surprisingly such reasoning can sometimes lead to misconceptions or causal misattributions. For example, Bruce VanSledright recounts an episode from a fifth-grade classroom: students were asked to explain the disappearance of the Roanoke colony. They reasoned that the colonists starved and, further, that they starved because the governor ate all their food. VanSledright speculated that their interpretation was based on a Disney cartoon depiction of a colonial pioneer settlement run by a very obese governor.<sup>54</sup>

Just as experts in specific disciplines use different literacy practices when they read

in their areas of specialization, instructional programs teach students to “read like a scientist” or to “read like a historian” by cultivating different literacy practices.

**Reading Like a Scientist.** One distinguishing feature of science practice is the use of representations and models to analyze situations and solve problems involving biological, chemical, and physical systems. Science literacy requires being able to translate among different representational forms to understand, reason about, and express key relationships among quantified variables. An item from the forthcoming College Board Advanced Placement (AP) test in biology illustrates these science literacy practices (figure 1).<sup>55</sup> It begins with a brief paragraph conveying several general principles related to how plants lose water, then provides a simple table that particularizes the relationship using temperature (an environmental factor) and water loss expressed as transpiration rate. For a student who does not already know the content in question, the paragraph provides the

basic information about the underlying causal mechanism of water loss. The three questions that follow ask the student to convert the data in the table into a graph; to predict and graph the impact of a second variable on the transpiration rate; and to interpret and explain the relationship of a third variable to the transpiration rate. Successful performance on this item would reflect proficiency at several reasoning practices of science, most importantly analyzing information in multiple forms of text, zeroing in on or selecting the most relevant information for each question, and synthesizing the information to generate predictions and explanations and support them with evidence.

Of many interventions using disciplinary content instruction in science, five stand out: Scientist's Notebook;<sup>86</sup> In-Depth Expanded Applications of Science (IDEAS);<sup>87</sup> Concept-Oriented Reading Instruction (CORI);<sup>88</sup> Seeds of Science/Roots of Reading;<sup>89</sup> and Reading Apprenticeship in Biology.<sup>90</sup> The first four target elementary and middle school students while the fifth focuses on high school students. Empirical studies, in some cases randomized field trials, have established the efficacy of each for improving science content and practices as well as comprehension of science text.<sup>91</sup>

The five programs share a common set of features, which vary as appropriate for the age and grade of the students. Learning objectives are framed in terms of underlying models of the science constructs, causal relationships, and mechanisms that explain the scientific phenomenon in question, like the water loss example from the AP test. Students work with data in multiple representations. A starting point for a science unit is frequently a process for eliciting students' conceptions of the phenomenon or their predictions regarding "what

would happen if..." questions. Students use data they collect themselves or find through close reading of text to prove or disprove their predictions. The programs vary in the emphasis they place on explicit instruction in strategies for reading science information. Close reading of texts also supports inquiry by describing mechanisms and processes that are not "visible." Students communicate their thinking in writing and in whole class and small group oral discussions, often collaborating as they interpret data in light of the patterns they find and information they read. Finally, students reflect on how and why their ideas have changed over the course of their investigations.

**Reading Like a Historian.** Engaged reading is at the core of history as a discipline. Indeed, a mainstay of the AP test in history is the document-based question, a free-response essay task that asks students to use the documents that the test provides for them, together with the history they have already learned, to analyze or explain a historical event or policy. A sample item from the College Board's website is illustrative.

**Directions:** The following question requires you to construct a coherent essay that integrates your interpretation of Documents A-I and your knowledge of the period referred to in the question. High scores will be earned only by essays that both cite key pieces of evidence from the documents and draw on outside knowledge of the period.

1. Analyze the international and domestic challenges the United States faced between 1968 and 1974, and evaluate how President Richard Nixon's administration responded to them.<sup>92</sup>

The item provides eight documents, which include excerpts from Nixon's speeches and

inaugural addresses, a political cartoon, a graph of the consumer price index from 1968 to 1975, correspondence between Nixon and Ho Chi Minh, an excerpt from a journalist, and an excerpt from a statement made by a Nixon strategist. Each document includes source information such as the author, date, and place of publication. Essays that rank at the top of the scoring scale (as listed on the College Board website) must include a clear thesis that is developed through analysis and evaluation of the documents in conjunction with “substantial and relevant outside information” about domestic and international challenges. Students must organize the outside information to make a clear and compelling case for the thesis, using such history reasoning strategies as sourcing, corroboration, and contextualization, and the close reading of documents that these entail.

Even students who have taken AP history courses struggle with the AP exam’s requirement that they integrate historical facts into explanations or arguments that can support a thesis.<sup>93</sup> The AP class requires a dramatic adjustment in most students’ view of history—from seeing it as a body of known facts to seeing it as an inquiry into the past whose trail of evidence is often incomplete. Such a “revisioning” requires an equally dramatic change in the teaching of history—from a litany of “who, what, where, when” to a process of piecing together the historical record to create evidence-based interpretive arguments.

Instruction that enables students to take such a dramatically different view of history stresses multiple perspectives on a historical event, as reflected in documents written at different times relative to the event (primary, secondary, and tertiary documents) and by individuals with different perspectives on the

event.<sup>94</sup> Close reading of documents begins with analysis of their sources and the context in which they were created and proceeds to ask whether and what information is consistent or inconsistent across multiple documents. Teacher prompts focus students on the aims and evidence used by a document author, on the words and phrases that lead students to accept the author’s account, and on information left out of a particular account.<sup>95</sup> Characteristics of source and context are critical in understanding the consistencies and inconsistencies across multiple documents. Teachers typically provide various ways for students to keep track of the sources of claims and evidence, along with their evaluations of that evidence. Collaborative conversations both in whole class and small groups enable students to challenge each other’s thinking, an experience that often brings to light a tendency toward “presentism”—the imposition of current norms and values on the actions and beliefs of actors from the past. To counter that tendency, instructional programs commonly emphasize the place of the documents, events, and actors in the economic, cultural, technological, and political circumstances at the time of the event in question. These programs also juxtapose documents with conflicting information and have students explore ways to reconcile the accounts, thus helping to move students away from thinking that “everyone is entitled to their own opinion” and toward being able to evaluate alternative accounts of historical events.<sup>96</sup>

### **Disciplinary Content-Based Instruction: Lessons Learned**

The descriptive and small-scale studies of promising approaches for building content-based literacy skills share several design features adapted to specific content areas: classroom discussion with specific



instructional routines for fostering disciplinary thinking; inquiry-oriented tasks and texts that enable students to answer questions using discipline-specific practices; and tools that support students' reading, writing, and sense-making activities.

Classroom discussion serves several functions, including introducing content in the younger grades to help establish the knowledge base that will be necessary once students have sufficient procedural literacy skills. Discussion provides a vehicle for externalizing the habits of mind—thinking and reasoning processes—characteristic of specific disciplines, as well as the academic language associated with them. Teachers can use particular “language frames” that facilitate conjecturing, engaging in “what would happen if” thinking, elaborating and seeking deeper explanations, proposing claims, offering evidence for claims, and contesting the claims of others. When student thinking is externalized, it can become the object of thought itself, increasing students' awareness of what they know and how they know it. Discussion also provides a window into student thinking that teachers can use to adapt and plan subsequent instruction.

Classroom discussion does not substitute for engagement with text, both reading and writing. Programs with promising results select carefully the kinds of tasks and texts they offer students and leave room for student choice. They offer tasks that highlight dilemmas, unsolved puzzles, and discrepancies for students to address. They pose authentic questions that motivate students to do the hard work of reading and struggling with seemingly conflicting ideas. Selecting appropriate texts and tasks requires anticipating the knowledge and conceptual skills students will need to use the texts to

accomplish the tasks successfully through close reading and disciplinary reasoning practices. Merely giving students a question to answer, some sources to consult, or some activities to do does not ensure understanding or critical thinking. The kind of reading and reasoning required depends on how the question or activity is related to the sources provided.<sup>97</sup>

Tools include prompts, note-taking structures, and graphic organizers that help students systematize and track the information they want to communicate as well as their own thinking. Although educators and researchers are familiar with how students work with the particular tools used in the various programs, they are as yet uncertain how to reduce gradually the level of support as students develop proficiency in reading to learn content. The new technologies of the twenty-first century also are likely to offer powerful new tools for content area reading with understanding.

### **Implications for Teaching: Integrating Literacy and Content Learning**

What will it take for American students to become proficient in the twenty-first-century literacies? The evidence indicates that students must become skilled in developmentally appropriate forms of *doing* history, mathematics, science, literary analysis, and the arts. Engaging consistently in reading and writing like a historian, like a mathematician, like a scientist will enable students to analyze, synthesize, evaluate, and make decisions regarding the validity and trustworthiness of information. Students must learn how texts function within a discipline and understand the inquiry frames and purposes that readers bring to texts and other artifacts of the discipline. Most teachers, however, have



themselves had little exposure to or experience with these literacy practices. To enable students to master these literacy skills, teachers must have opportunities to develop the pedagogical content knowledge that allows them to integrate content learning and literacy practices within the discipline. They must understand how to support the learning of their students through classroom discussions that foster engagement with content and text, as well as through use of the discourse practices specific to the content area, in a classroom context that stresses thinking and inquiry.

Professional development that builds the capacity of teachers to foster this kind of learning environment requires long-term investment and commitment. Teachers need to re-envision reading and writing as tools for developing subject-matter knowledge as well as practices inherent in generating new knowledge. The transformation can be facilitated by teachers' being able to see into other classrooms through videos; increasingly

as remote cameras become more advanced, virtual classroom visits may also be possible. But simple exposure to different ways of teaching and learning are not enough to support and sustain change. Many reform projects have identified the need for teacher networks or learning communities that support and foster the ongoing learning that is necessary for sustaining and deepening instructional improvement.<sup>98</sup> Effective teacher learning communities also depend on school- and district-level commitment to a sustained process that builds coherently toward shared goals.

The literacy demands of the twenty-first century and beyond raise the bar on what American students need to achieve. For them to rise to the challenge, we as a society must recognize and meet not only their needs but also those of their teachers. An emerging knowledge base suggests strongly what needs to change and how it needs to change. We need to support educators in making that change.

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# The Importance of Infrastructure Development to High-Quality Literacy Instruction

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*David K. Cohen and Monica P. Bhatt*

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## Summary

Although the education community has identified numerous effective interventions for improving the literacy of U.S. schoolchildren, little headway has been made in raising literacy capabilities. David K. Cohen and Monica P. Bhatt, of the University of Michigan, contend that a major obstacle is the organizational structure of the U.S. education system. Three features in particular—the lack of educational infrastructure, a decentralized governance system, and the organization of teaching as an occupation—stymie efforts to improve literacy instruction.

The authors emphasize that the education system in the United States has always been a patchwork of local school systems that share no common curricula, student examinations, teacher education, or means of observing and improving instruction. Although localities have broad powers over education, few have built the capability to judge or support quality in educational programs. The quality criteria that have developed chiefly concern teachers, not teaching. The decentralization and weak governance of U.S. schooling also deprives teachers of opportunities to build the occupational knowledge and skill that can inform standards for the quality of work, in this case instruction. And, unlike practitioners in other professions teachers have little opportunity to try to strengthen teaching quality by setting standards for entry to the occupation.

Cohen and Bhatt review six types of organizational reforms undertaken over the past several decades to improve literacy and other academic outcomes for U.S. students. After briefly describing accountability, comprehensive school reforms, knowledge diffusion, improvement of human capital, and market-based reforms, the authors turn to the Common Core State Standards, an effort initiated by state governors and school leaders to raise student achievement. The authors conclude that the fundamental question about the Common Core, as with the other reforms they discuss, is whether educators and policy makers can mobilize the capability to help states and localities invent, adapt, and implement reliable ways to improve instruction.

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Ongoing efforts to design and disseminate interventions to improve literacy outcomes for U.S. schoolchildren have been something of a success story, but the nation's schools have been less successful in their implementation and use of these interventions. Despite the availability of best practices, the quality of literacy instruction in the United States is quite variable, and the variations contribute to unequal achievement for students. We attribute this incongruence to the unusual organization of the U.S. education system. In this article we tackle two questions. What organizational characteristics of the education system have hindered the development of consistently strong literacy instructional programs? What changes in school organization could help to develop and sustain consistently high-quality literacy instruction?

Beginning with the first question, we argue that the key organizational features that have shaped the quality of teaching in all subjects, including literacy, are the lack of educational infrastructure, a decentralized governance system, and the organization of teaching as an occupation. Each of these features impedes efforts to improve literacy instruction, yet they are seldom the target of reforms.

To begin to answer the second question we consider several reforms that have recently been at the forefront of organizational change: accountability, comprehensive school reforms, knowledge diffusion, improvement of human capital, market-based reforms, and the development of the Common Core State Standards. We discuss the potential each has to improve literacy instruction as well as its limitations, and we evaluate which might be most likely to improve literacy instruction.

## How Organization Influences School Quality

When inspectors visit a construction site to assess the quality of work, they do so against a building code; this code typically is written out in detail and is used to guide work and teach apprentices.<sup>1</sup> When hospital head residents supervise interns as they take patients' histories or check blood pressures, they compare the interns' work with established procedures, many of which are written down and used to guide work and teach novices. In these cases and many others, the quality of workers' performance is measured in light of occupational standards.

That has not been the case for teaching in U.S. public schools. No common standards exist against which teachers' performance can be judged, and thus no inspection of their performance is conducted in light of such standards. There have been standards of a sort, but they have either not focused on performance or not focused on it in sufficient detail to discriminate acceptable from unacceptable work. Yet teaching is by far the largest school influence on learning, so teaching quality is central to academic achievement. To understand the quality of literacy and other academic work in U.S. schools, one must first understand why the United States has no framework—no educational infrastructure—that could inform teaching and teacher education and support valid judgments about the quality of teaching.

### Defining Educational Infrastructure

The elements of educational infrastructure include examinations, curricula or curriculum frameworks, teacher education, inspection systems or other means to observe and improve instruction, and a teaching force whose members succeeded in those curricula and exams as students. Some national school systems have all of these elements while

others have different subsets; a few U.S. subsystems have a few of the elements. In some cases the elements are deliberately aligned, while in others they appear to be somewhat independent. Teachers who work with such infrastructure have instruments they can use to set academic tasks that are tied to curriculum and assessment. The framework can help them to define quality in students' work and provide valid evidence of instructional quality. Teachers can develop a common vocabulary to aid them in working together to identify, investigate, discuss, and solve problems of teaching and learning. They thus can develop occupational knowledge and skill that are held in common and communicated within the occupation and over time. Such knowledge and skill can inform standards of quality work in education, as they do in plumbing and electrical work. Individual school systems with such infrastructure also may have the means to influence instruction more broadly.

The mere existence of infrastructure does not ensure excellent or effective education; that depends on how well the infrastructure is designed and used. Design deals with the scope, content, and organization of curricula; the nature of assessments; the organization and content of teacher education; and the links among these elements. The design of infrastructure also influences use, both through the extent to which the instruments are made intelligible and accessible to practitioners and by the existence of agencies and procedures that monitor and improve use. Use can be influenced by the presence or absence of time and procedures for collective work on teaching and learning, by standards for entry to the occupation, by requirements for education and training, and by criteria for promotion; in some national systems, for example, promotion and tenure depend on

the demonstration of competent classroom practice.

### **Consequences of the Lack of Educational Infrastructure**

Such a common infrastructure did not develop in American education. The movement to make education available to all American children was primarily local, both politically and economically, and resulted in thousands of school districts. Decisions about what students would learn and who would teach them were local. The mass enrollment that ensued was, as Claudia Goldin and Lawrence Katz have shown, a remarkable achievement, but the resulting education "system" had little in the way of common framework.<sup>2</sup>

This lack of a common infrastructure led to the development of several unusual features in U.S. public education. One concerned testing: because there was no common curriculum, a nationwide or even statewide test that assessed the extent of students' mastery of a curriculum was impossible to devise. As a result, American standardized tests at the state and national levels are designed to be primarily independent of particular curricula; furthermore, because these tests are expensive to develop, districts and schools could not afford to devise rigorous standardized tests that were tied to their own curricula.<sup>3</sup> Education of teachers was a second anomaly: absent a common curriculum, teachers could not learn how to teach it, let alone how to teach it well. As a result, decades of studies have found that teachers arrive at their first teaching jobs with little or no capability to teach specific subjects. A third anomaly is textbooks. Absent guidance from an established curriculum or, until very recently, curriculum frameworks, publishers had incentives to produce texts that covered anything that might be taught in that subject

*To be a good teacher in these circumstances has meant doing something constructive with the students who show up, whether or not they want to be in school and whether or not they want to study.*

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in that grade, as long as it did not offend local religious or political preferences. As academic knowledge grew, and conceptions of how it might be taught diversified, textbooks thickened, there being no common guidance for an academic diet. Some contain far more content than can be dealt with seriously in a school year. A fourth anomaly is academic standards, which developed in ways that parallel the features of U.S. education discussed here, that is, they are generic rather than based on a common curriculum.

These four anomalies arise from several unique features of U.S. public schools, to which we turn next. One is political: decentralization and weak governance begin to explain why teaching quality has been so persistently modest. The second, the organization of the occupation of teaching, adds to the explanation.

### **Governance Structures**

Local control of schools in the United States is less attributable to ideology than to political and cultural norms in the early and middle nineteenth century. A deep commitment to education in the northern states and a society and economy that were mostly rural and thus quite local combined with a deeply rooted

mistrust of strong government to tie schools to local communities. Although state and federal action helped to enable schooling, school systems developed locally; eligible voters elected school board members and even superintendents in some cases. These officials in turn set or accepted existing policies and procedures for operations, curricula, and personnel—all at the local level. Teachers often “boarded around” with families. Voters exercised their preferences through formal political and informal social means. In these ways schools were held accountable to the communities in which they resided.

What developed was an organization that suited local taste—local districts were the chief operating agencies—but was quite fragmented and tied to local politics. There now are more than 14,000 local educational authorities, each of which makes decisions on a great range of issues from funding to the nature of the educational program to who will be hired to teach. Despite these broad powers, few localities have built the capability to judge or support quality in educational programs. They employ few staffers with expertise in curriculum and fewer still with expertise in instruction or on-the-job teacher education; until very recently, local work on assessment focused on managing standardized testing, not on monitoring or evaluating educational quality.

This does not mean that educational quality went missing, but rather that it was attended to in ways that fit with the politics of education and the exigencies of a large, decentralized nation. The quality criteria that developed were chiefly criteria of teacher quality, not teaching quality, and they were largely independent of teaching performance. The tacit assumption was that teacher quality was a proxy for teaching quality. In

addition, teacher education was not organized nor informed by mapping backward from evidence of good teaching to the teacher education that would be likely to lead to such teaching.<sup>4</sup> The lack of attention to teaching quality is deeply rooted in U.S. public education, and we discuss efforts to change it later in this article. But first we explore how the past and current organization of the occupation of teaching has influenced teaching quality.

### **The Organization of Teaching as an Occupation**

The organization of government is not the only influence on quality in teaching. The conditions of employment also have a powerful impact, as does the organization of entry to the occupation. These elements influence the quality of teaching by shaping the qualifications of those who teach and the circumstances in which they perform.

### **The Conditions of Employment**

Public school teaching has been a wholly owned subsidiary of the state since public education developed in the United States. The day-to-day conditions of teachers' employment—how they can organize to deal with educational quality, as well as their workload, class size, time for preparation, salary, vacation, whether they have an office or a telephone, when they can use the bathroom, and perhaps most important, who their students are—have been set by government and those who manage government agencies. Mass attendance has meant that most schools are oriented to batch-process many students; compulsory attendance has meant that families can choose schools and teachers chiefly by deciding where to live; management of instruction has meant that few teachers have much choice about who they will teach, save by deciding where to

work. To be a good teacher in these circumstances has meant doing something constructive with the students who show up, whether or not they want to be in school and whether or not they want to study. One consequence of this arrangement has been that many schools did not make high-quality instruction a top priority.

Teachers have received some compensation for these conditions, chief among them job security in tenure and freedom to decide, behind the closed classroom door, what and how to teach. These arrangements have helped to ensure enough staff for an essential public service but have done little to encourage quality. When professions and other occupations were virtually closed to women, schools were able to recruit many academically qualified teachers, but as other professions opened to women, the conditions of teachers' employment have had less appeal, and the academic ability of entering teachers has declined.<sup>5</sup>

### **Entry to the Occupation**

Those long-standing limitations might have been less constraining if the occupation had been able to use licensure and professional education to shape standards of quality and entry to the occupation. If the occupation had had a strong influence on these matters, it might have exercised a fair degree of control over its membership, much as the American Bar Association does for lawyers and similar organizations do for accountants and architects, thus enabling teachers to set and enforce norms of practice and influence teachers' knowledge and skills. It is impossible to know what would have happened had teachers enjoyed such influence, but because they had little control of entry to the occupation, preservice education, or licensure, organized teachers have had no

opportunity to try to strengthen teaching quality by setting standards for entry to the occupation. Unlike practitioners of plumbing, medicine, accounting, and law, teachers have had very little to say about who can become a teacher or what they must know and be able to do in order to teach. As a result, most teachers have been poorly educated, and their knowledge and skills have improved only modestly during their careers. In addition, the absence of opportunities to cultivate quality in teaching has deprived teachers of what might have made it a more skilled occupation.

State education agencies and legislatures regulate entry to the profession and quality. There have been three sorts of requirements: taking college courses in teacher education; having clinical (classroom) preservice experience; and, in forty-eight states, passing a test that claims to assess knowledge of teaching, subjects, and learning. A series of studies has shown these requirements to have very little bearing on teacher effectiveness.<sup>6</sup> This finding perhaps results in part from the diffuse coursework curricula and sequences that are often undertaken in teacher-preparation programs and from tests that the vast majority of education students pass with flying colors. States have regulated teaching based on characteristics unrelated to classroom performance. States also have responded to local teacher shortages by granting emergency licenses, which permit schools to hire teachers who do not meet even the modest conventional requirements. There is no principled reason that state agencies could not set much more demanding educational requirements for licensing, but local demand for inexpensive teachers, states officials' unwillingness to buck that pressure, and the lack of state policy makers' appetite for stringent oversight of local practices seem to have been more compelling.

The teacher education resulting from such licensing has quite weakly prepared most of those who teach. The curricula of most teacher-education programs have given would-be teachers very little instruction in how to teach, let alone extended opportunities to learn how to teach from expert practitioners. Even less attention has been paid to how schools and teachers could organize to sustain academically demanding work. These features of teacher education are no accident. Few universities have tried to devise high-quality programs, because teacher education has been a low-status enterprise, because most school of education faculty members have tried to distance themselves from teacher education, and because university faculty and managers have not wanted to upset relations with state regulators and local schools or to lose revenue from low-cost teacher-education programs. Organized teachers never responded to this failure of responsibility by mounting a serious campaign for much better teacher education.

### **Efforts to Improve Instructional Quality**

Despite the inertia on the part of school regulators and educators themselves, the United States is alive with several quite different sorts of efforts to upgrade teaching quality. The most prominent are state and federal standards-based reform policies that attempt to improve operations within classrooms and schools by building an exoskeleton of academic standards, tests, and professional accountability around state and local school systems. Less prominent but still significant are several efforts to build the educational infrastructure that has been largely absent from the U.S. mainstream. These system-building endeavors include several comprehensive school reform designs (CSRDs) and a handful of charter networks. In contrast to



efforts that try to shape classroom work from the level of policy, these are efforts to shape classroom work from the level of practice; one can think of them as building from the inside rather than the outside. A third approach seeks to enhance and expand knowledge of effective instructional practices. To date, the chief example of this approach, which is focused on reading, consists of researchers' efforts to delineate the most effective teaching practices, based on studies of learning and teaching, and to disseminate the findings through a variety of more or less conventional channels. The key agent of change in this approach seems to be knowledge, apart from organization at either the policy or practice levels, and the key players include networks of reading researchers, practitioners, and some federal agencies.

A fourth set of approaches consists of efforts to improve the quality of teaching by recruiting more able teachers to work in schools with the most challenging students, by devising more effective ways to educate teachers, or by using evidence of teachers' effectiveness to weed out the least effective. Although these three efforts differ in important ways, they share the notion that human capital is the key point for intervention. A fifth approach is more organizational and focuses on moving key decisions about schooling away from government and toward markets, either by means of tuition vouchers or charter schools. A sixth approach, the Common Core State Standards, on which we focus much of our attention, is the most recent reform initiative that addresses potential development of an educational infrastructure that can produce high-quality literacy education. Although it began as a version of standards-based reform, this approach may prove to be more ambitious than that.

## **Accountability**

In the past several decades, state and federal education policy makers have been part of an unprecedented effort to raise the quality of learning and teaching. These policies have helped to bring attention to weak schools, to mobilize concern about inequality, and to encourage efforts to improve teaching and learning. Studies show that these accountability systems have led to better student performance on low-stakes mathematics tests, that is, tests that are not tied to accountability or funding at the teacher, school, or district level. Scores on the National Assessment of Educational Progress (NAEP) fourth-grade math tests have improved appreciably, but that improvement far predates No Child Left Behind, and the gains seem to have fallen off in the few years following the federal legislation's passage in 2001. NAEP fourth-grade reading scores also have improved, but only slightly, and the eighth-grade NAEP results have been close to flat.<sup>7</sup> The black-white test score gap remains large.<sup>8</sup>

One reason for that may be the implementation of the accountability systems. For example, the Improving America's Schools Act of 1994, Goals 2000, and the No Child Left Behind Act of 2001 sought to bring coherence to schooling by aligning academic standards, educational processes, and outcomes. Although these policies sought to remedy the chronic incoherence of U.S. public education, they were put into practice in many thousands of autonomous state and local jurisdictions and schools that had long been fragmented and weak, with no agreement on what constituted school improvement.

Fragmented and weak governance shaped implementation. As a result, the rigor of state academic standards, curricula, and tests varies greatly among the states. Many states



have sought to decrease the number of failing schools by setting only modest standards and criteria for proficiency on tests. State tests have often become the basis for a proto-curriculum on which students are drilled in procedural skills; academic achievement in many weak schools has improved little or not at all.<sup>9</sup>

Perhaps a larger problem with the development of these accountability systems is that educators in weak schools may not be able to use the policies effectively without more support than the standards, tests, and accountability offered by the policies. To be effective, teachers need instruments that connect standards and assessments with practice; these instruments include curriculum and teacher know-how to use the curriculum well. That, in turn, requires teacher education as well as a school organization and management focused on improved teaching and learning. Policy makers seemed to assume that state and local educational authorities would have the professional capacity to implement these accountability reforms with fidelity. The poor fit between the policy designs and the organizational sources of weak teaching quality discussed earlier helps explain the weak results of these policies.

### Systems of Schooling

If these federal accountability policies fell short in their broad goals, they did help to promote several productive approaches to school improvement. In contrast to the federal “exoskeleton” policies, comprehensive school reform designs and several charter networks center their work on improvement at the school and school-system level. Researchers have studied three leading CSR models that focus on high-poverty elementary schools and have found that two of them—America’s Choice and Success for

All—have had especially positive effects on students’ reading achievement, raising it by an average of 10 percentage points in each grade.<sup>10</sup> Several other evaluations have found that the third, Core Knowledge, also has had positive effects on student achievement.<sup>11</sup>

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*If one point of this story is that much better teaching and learning cannot be engineered from a great distance alone, another is that it cannot be done in a systemic fashion up close alone.*

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America’s Choice and Success for All, which are both private companies, offer schools a comprehensive design that addresses many problems concurrently. Most important, they work on classroom practice, designing new educational practices and helping teachers and school leaders to learn them by offering strong guidance for curriculum, teaching, learning, and school organization. The companies work closely with teachers for many years to improve classroom practices, and with school leaders to help them learn to manage their work so that it focuses more effectively on student learning. Put a little differently, these CSR models have built elements of the infrastructure that have usually been missing in U.S. schools. Given the schools’ weaknesses and the designs’ complexity, it would have been demanding to improve just a few schools. It was much more demanding to work with six hundred (America’s Choice), or more than a thousand (Success for All). To do that work,

the designers built national organizations to recruit and select schools; to teach school staff how to lead and teach; to recruit, hire, and educate staff; to find, adapt, or develop materials to use in classrooms; to monitor implementation and solve problems; to manage relations with school districts; to raise money to support all this work, and more.<sup>12</sup>

These are alternative school systems of a sort, and they do many things that few state and local school systems in the United States do, but that are familiar in other national systems: curriculum, professional education, quality control, performance analysis, and the like. They take individual schools as the primary unit of intervention, but theirs is not a scheme to reform one school at a time; they build systems of schooling and design those systems to support improvement in the smaller systems that we call schools. Anecdotal evidence suggests that several charter school networks—Achievement First, Knowledge Is Power, Aspire, and Uncommon Schools among them—do similar intensive, close, sustained work on practice, although with new schools that they create rather than with existing schools that they help to re-create.

If one point of this story is that much better teaching and learning cannot be engineered from a great distance alone, another is that it cannot be done in a systemic fashion up close alone. Both the CSRDs and the charter networks would not have been possible without comprehensive federal and state legislation that provoked and promoted improvement in high-poverty schools. Title I of the 1965 Elementary and Secondary Education Act provided high-poverty elementary schools with a stable source of funds they could use to purchase materials and services from the CSRDs. Other state and federal reform policies pressed schools to improve and

opened up opportunities for charter schools; the policies helped to create demand for the solutions that the CSRDs and charter networks offered. The federal Obey-Porter Amendment in 1997 helped to legitimize the CSRDs and offered funds to support state and local adoption. There can be helpful relationships between the close-in work of school improvement and the most distant public and private influences. We return to this question of whether influences distant from practice can be shaped to support the closer-in work of school improvement when we take up the Common Core State Standards.

### **Knowledge Production and Dissemination**

A third reform initiative focuses on the diffusion of knowledge concerning effective teaching practices to influence literacy instruction. In recent years, researchers and government officials have collaborated to scrutinize research on reading, discern evidence of effective practice, and use that evidence to influence teaching and learning. These efforts focused on early reading, including phonics, phonemic awareness, and related matters. In 1997, Congress authorized a national panel “to assess the effectiveness of different approaches used to teach children to read.” After two years of reviewing research and meeting periodically, the National Reading Panel issued a report in April 2000 entitled “Teaching Children to Read” at a hearing before the U.S. Senate. The report systematized knowledge and used conventional means—written materials and professional meetings among them—to make the findings available to researchers, teachers, teacher educators, and others interested in the issue.

Because reading is an especially well-organized subspecialty of education that

includes researchers and practitioners, knowledge diffusion to practitioners about effective teaching practices has been relatively widespread throughout the United States. The actual effects on practice are harder to discern. Many studies based on teacher reports of instructional practice show that despite the advice of researchers and others, teachers still rely heavily on reading textbooks, or basal readers, to teach reading, particularly in elementary schools. For example, in 2000 James Baumann and others replicated the classic 1963 study by Mary Austin and Coleman Morrison, “The First R: The Harvard Report on Reading in Elementary Schools.” Baumann and his colleagues found that the share of teachers who relied on basal readers as curricular material declined from 97 percent in the earlier study to 83 percent—still a large share considering the extent to which research has advocated the use of other curricular materials in lieu of basal readers.<sup>13</sup> More recent observational studies corroborate these teacher reports and also reveal high levels of procedural reading skills instruction.<sup>14</sup> Although the reading community has been more successful than most in diffusing knowledge of best practices through programs, reports, and practitioner guides, what evidence there is suggests that those practices have not been implemented in classrooms extensively or with fidelity.

### **Improvement of Human Capital**

A fourth collection of strategies seeks to improve the management and quality of human capital in schools and school systems. One set of initiatives aims to get more effective teachers into schools; another attempts to distinguish more- from less-qualified teachers either to reward the former or push out the latter, or both. The best-known examples of the first set of approaches are Teach for America (TFA) and some teacher residency

programs, which recruit bright and engaged individuals to teach in high-poverty schools with the support of training designed for them. These programs have succeeded in recruiting many thousands of teachers. For example, since 1990, nearly 33,000 individuals have joined TFA and, as corps members and alumni, are reported to have reached more than three million students across 100 urban and rural school districts in 27 states.<sup>15</sup> The pool of recruits to these programs is growing, a fact that also can be counted as a success. The influx of bright new teachers represents an important change given the thirty-year drop in the average SAT scores of entering teachers.<sup>16</sup>

Yet the educational effectiveness of this approach depends on four things: a ready supply of very bright, highly educated people; no great disproportion between vacancies in teaching and the new recruits; the sponsors’ capability to educate recruits to do good work under difficult conditions; and the schools’ and school systems’ capability to use the new recruits effectively. The National Center on Education Statistics reports that 8 percent of the nation’s 3.3 million teachers leave the profession annually, creating more than 250,000 vacancies. Even the most effective alternative teacher recruitment program would not be able to fill this gap in a systematic fashion, particularly given high levels of selectivity in the program’s application process.

Furthermore, the effects of teacher recruitment programs on student performance have been mixed. A national randomized-control trial showed that the math achievement of students of TFA teachers increased about 0.15 of a standard deviation, or approximately one additional month of math, compared with that of students of non-TFA teachers,

but that students of both sets of teachers performed equivalently in reading. No significant difference was recorded for other student outcomes, such as attendance, although TFA teachers reported more problems with classroom management than their peers.<sup>17</sup> That TFA corps members' students did no worse, despite their teachers' lack of teacher education and experience, is probably the real news. Although these trial findings are not a ringing endorsement of the education or qualifications of the regular teachers with whom the new recruits' work is compared, neither do they suggest that the new recruits are, on average, a dramatic improvement.

The key point, given our earlier analysis, probably concerns schools' and school systems' capability to use the new recruits effectively. It matters whether the new recruits are part of a strategy to improve particular schools or are simply used to plug vacancies that come up in the system. They are much less likely to have a sustained effect in the latter case. The recruits' effectiveness as teachers depends at least as much on the schools' ability to use them well as on the recruits' talent. That, of course, applies with equal force to the teachers already at work in the schools; the local action that is likely to make the new recruits more effective also would be likely to make the existing teachers more effective. Such action depends a great deal on state and local school systems and somewhat less on the new recruits and their sponsors. Local capability is indispensable, whatever the initiative and however appealing it seems.

The second human capital approach that seems likely to play a large role in school improvement is teacher evaluation and selection based on teachers' contribution to

students' learning. This approach aims to reward the more effective teachers, typically through merit pay, or to weed out the less effective, or both. It has considerable political appeal, for it promises to improve schools without meddling with curriculum, teaching, or local control. Because initiatives of this sort make measurement a central element in school improvement, their effectiveness depends on the quality of the measures, how they are used, and the circumstances in which they are used.

The most controversial aspect of these proposals is the use of longitudinal measures of student achievement, called value-added measures, to estimate teachers' contribution to students' learning. Teachers whose students make greater gains, given their entering scores, are judged to be more effective and to merit continued employment and perhaps other rewards. Teachers whose students gain less are candidates for re-education or dismissal.

These measures raise some technical concerns. One is inconsistency among the tests. Heather Hill, a Harvard researcher, found that students' performance on two tests of the same content area could vary depending on the test used, because the tests used different measures of the same content. Hence the performance rewards that their teachers would receive (or not) also would vary with the tests that were used.<sup>18</sup> The concern would not arise if both teacher evaluation and testing were consistent between states, but if states used different tests, discrepancies would exist among states. Another concern is the tests' reliability, that is, the degree of error in measures of gains in students' achievement. Degree of error can be seen as the difference in the same students' scores on the same test taken at two closely

related times; the smaller the difference, the less concern about measurement error. Researchers persistently find test-retest reliability to be low, and Hill argues that distinguishing between the effectiveness of two teachers would be difficult unless their value-added scores were very far apart. Finally, many teachers teach subjects that fall outside annual standardized testing, which means value-added measures could not be used as part of their overall evaluation.

A more fundamental question is whether student test scores are a valid, unbiased measure of teaching quality. In a systematic study of elementary schools, Robert Pianta and his colleagues report only modest correlations between the value that teachers add to students' scores and how trained observers rank teaching quality.<sup>19</sup> More recent studies use experimental and quasi-experimental methods to show that value-added measures do correlate to life outcomes for students, such as teen parenthood, college attendance, and earnings.<sup>20</sup> In an analysis of the measurement issues at stake, Hill concludes that the evidence "suggests that observational and value-added indicators of teacher effectiveness do converge, but the extent of convergence is unknown."<sup>21</sup>

Other research suggests that the validity of value-added measures is sensitive to the tests used, to how teachers and students are assigned to work together, and to resource differences among schools. Although evidence indicates that value-added measures do gauge teachers' effectiveness, careful consideration must be given to the ways in which this information is used. One positive outgrowth of the vehement reaction against the use of value-added measures has been to encourage new avenues of research on measuring effective teaching and to change

the conversation about teacher evaluations. It remains to be seen how the practice of teacher evaluation will be affected.

The issues raised here suggest the need to define very clearly what separates those teachers who are deemed effective from those who are not. One recent study suggests that replacing the bottom 5 percent of teachers with better teachers would dramatically change life outcomes of students.<sup>22</sup> Still, making teachers' jobs contingent on students' test scores will affect how teachers approach and execute their work. States or districts that adopt merit pay proposals should take into account that many teachers lack the instructional know-how to boost students' scores. That gap between criteria of teaching proficiency and the capability of many schools and teachers creates an appreciable incentive to cheat, as recent developments in several cities have revealed in connection with No Child Left Behind and state accountability regimes.<sup>23</sup> In addition to the technical issues, merit pay schemes would be less likely to produce damaging results if they helped develop the professional capacity of teachers and schools.<sup>24</sup>

### Market-Based Reforms

An increasingly popular set of reforms is based on the idea that markets would be an effective means to improve schooling. Supporters of tuition vouchers and charter schools argue that a state school monopoly lowers educational quality by reducing schools' incentives to perform well and by making them less responsive to families. The assumption is that if the state monopoly can be broken or substantially weakened by creating markets for schooling, family choice (and incentives for schools to perform) would result in a better fit between what schools offer and what parents and students



prefer, thus improving quality. The chief impediment to quality is considered to be the political and economic structure of schooling, not the schools' educational organization and operation. If the political and economic structure of schooling can be significantly changed, supporters argue, educational organization and operation will improve.

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*Although some studies show significant effects for some charter schools in certain grades and subjects, these findings have not yet been replicated consistently.*

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Tuition vouchers have been tried only in limited and somewhat unusual circumstances, and the evidence on their operation and effects is also limited and rather uncertain. One study reported significant gains for African American students on standardized test scores (about one-third of a standard deviation), but others reported less promising results. Charter schools, by contrast, have been tried on a larger scale, and their numbers continue to increase every year; as a result, more evidence has been gathered about these schools' operation and effects. A recent meta-analysis of charter school studies by the Center on Reinventing Public Education, an independent research organization based at the University of Washington, reported mixed evidence on efficacy. For example, the analysis found that charter schools outperform traditional public schools in elementary school reading but underperform in high school reading.<sup>25</sup> A study by Stanford University's

Center for Research on Education Outcomes reported even less impressive results.<sup>26</sup> Although some studies show significant effects for some charter schools in certain grades and subjects, these findings have not yet been replicated consistently, and few of the studies offer any information about the educational program of charter schools that might help explain their varied efficacy.

Our conjecture, doubtless predictable from what we already have written, is that the central problems of U.S. schooling are systemic and that stand-alone charter schools are less likely to develop the capability to offer high-quality education than charters that are part of a system that mobilizes the human, social, and educational resources that support an intense and sustained focus on improving instruction. Unlike stand-alone charter schools, systems like *Aspire*, *Achievement First*, *Uncommon Schools*, and *Knowledge Is Power* appear to mobilize those resources, much like the comprehensive school reform designs discussed earlier. Steven Wilson makes the same argument, writing that if schools treated instructional improvement as a problem of building educational systems—using coherent, academically focused designs for instruction and management, including curricula, assessments, and teacher development to help capable people to do good work—the schools could succeed even if the teachers did not work 24/7, had families, and did not graduate from Princeton or Amherst.<sup>27</sup>

### **The Common Core State Standards**

Each of the approaches already discussed has been instituted in some form in the past twenty years in the United States; none has delivered dramatically different results in a systematic way. Partly in response to the continuing pressure for school improvement,



and with an eye to most states' likely failure to meet the goals of No Child Left Behind, a coalition of state agencies, governors, and interested private organizations created the Common Core State Standards Initiative, a standards-based reform focused chiefly on devising common academic standards and assessments. But in its efforts to raise academic achievement with these tools, the initiative may move beyond the state and federal policies of the past twenty years to support the development of some elements of educational infrastructure, including teacher education and curriculum. We explore this initiative here because it may have the potential to deal with some of the deeper problems of U.S. schooling, and because it raises important issues for efforts to improve teaching and learning in literacy and other subjects.

The Common Core is sponsored by the National Governors Association and the Council of Chief State School Officers (CCSSO). In the spring of 2009, the two associations announced that, in partnership with Achieve, a nonprofit education reform organization, they would devise "college and career ready" academic standards to "raise the bar" for all students in all states and to "increase the rigor and relevance" of state standards.<sup>28</sup> Standards in English language arts and mathematics have since been developed and reviewed and have been well received. Although adoption was voluntary, forty-eight states committed to adopt the standards even before they were in first draft.

One reason for that broad support is that, at its heart, the Common Core is a state effort to assume more initiative in education policy, in part by setting tasks for the states that trump anything the federal government might attempt. Another reason is that No Child Left Behind created an unsustainable

situation for states and the federal government. Many more schools were identified as failing than could be repaired, the goal of "proficiency" will not be attained by the mandated date of 2014, and state-to-state differences in standards and tests have damaged the measure's effectiveness and credibility. Federal officials welcomed the Common Core initiative partly because it provides a state-based solution that allows the federal government to extricate itself from many of these problems.

Federal policy makers can support common state standards and leave the most difficult work to states, while still playing a role that includes assistance and some oversight. The CCSSO report that launched the Common Core effort argued that federal policy makers should offer funds to help underwrite the states' costs, to help states develop streamlined assessment strategies that facilitate cost-effective international comparisons of student performance, and to boost federal research and development to provide states with more and better information about international best educational practices.<sup>29</sup> The U.S. Department of Education offered up to \$350 million to help states develop improved tests that align with the Common Core standards, and two consortia of states are currently working on developing such tests, a first in the United States.

Given this widespread federal and state support, the key question is whether the Common Core initiative can bring about substantial school improvement and thereby influence high-quality instruction in all subjects, including literacy. If the initiative develops well, it could bring greater coherence and quality to instruction, and perhaps even less inequality. But how the Common Core develops will depend on how states

and their supporting organizations deal with several issues.

First, will the Common Core actually set, and the states embrace, standards that, to paraphrase its words, raise the bar for all students, are rigorous, and become the common core of state school systems? The standards are voluntary. Although the CCSSO initially hinted that states would have flexibility to tailor common standards to their situations and preferences, it appears that states must adopt the standards wholesale.<sup>30</sup> David Wakelyn, the program director of the education division of the National Governors Association's Center for Best Practices, was reported to say, "You can't pick and choose what you want. This is not cafeteria-style standards."<sup>31</sup>

By March 2012 all but six states had adopted the standards in reading and mathematics, but writing and adopting standards is very different from aggressively implementing them. Thus far only a few states, Massachusetts and Minnesota among them, have adopted demanding standards and worked to implement them with fidelity. Both states improved test scores for many students, but both have had major problems improving education for children from poor families.<sup>32</sup>

The broader question, however, is whether a reform restricted to standards and assessments can change schools. The Common Core website acknowledges as much. "States know that standards alone cannot propel the systems change we need," the website says, and lays out a list of tasks for states to tackle if they wish to make the standards effective.<sup>33</sup> But will states be able to clearly articulate what is expected of students academically? Will they be able to persuade test and text publishers to align their products to Common Core standards? Will states give

clear and detailed guidance for teaching and teacher education? Will they help schools and teacher educators to build the capability to support more focused, coherent, and improved instruction? That would require agreement not only on standards but also on the content and quality of instruction and teacher education. It also would require a great deal of re-education of educators and school administrators. In short, to put the Common Core standards into practice, states would have to build infrastructure.

The questions open up a paradox at the core of the Common Core: the initiative limits itself to standards and assessments, yet it proposes to deeply change schools.<sup>34</sup> The standards could enable participating states to articulate expectations for students to parents, teachers, and the general public; align textbooks, digital media, and curricula to the internationally benchmarked standards; ensure that professional development for educators is based on identified need and best practices; develop and implement an assessment system to measure student performance against the Common Core standards; and evaluate policy changes needed to help students and educators meet the Common Core state college and career readiness standards.

Yet, states and localities have rarely done such work, and their capability to do so effectively is quite modest. For example, to articulate clear expectations about student performance to parents, teachers, and the general public, state and local school systems would have to be much more explicit than they have been about what is to be taught and learned in school. Most schools, school systems, and governments have long avoided such clarity, in part because clarity produces conflict. Americans disagree deeply about

what should be taught and learned, and have since the institution of public education. Hoping to avoid such conflict, officials leading the Common Core initiative reportedly said they would not prescribe “how teachers get there [that is, raise student achievement], thus avoiding nettlesome discussions about whether phonics or whole language is a better method of teaching reading; whether students should be drilled in math facts; or whether eighth-graders should read *The Great Gatsby* or *To Kill a Mockingbird*.”<sup>35</sup> One way to avoid such disagreements is to paper over them with language offering little specific guidance, as standards often do. Another, familiar from many standards and textbooks, is to include nearly everything, an approach that also offers little guidance.

Aligning curriculum materials with standards and assessments presents another set of issues. The problems arise in part because valid judgments about alignment can be quite difficult to make. Arithmetic, for example, can be taught in several quite different ways, some traditional and didactic and others unconventional. Mathematicians and mathematics educators often disagree intensely about such matters, and such disputes would more than likely intensify if states got to the point of trying to achieve alignment. The problem is sufficiently daunting to prompt Jack Jennings, an experienced observer of education policy, to suggest that an independent agency might be better able than states to make determinations about alignment.<sup>36</sup> The idea is appealing, for, among other things, it could use economies of scale to reduce the costs of the work. The difficulty lies in persuading state policy makers to hand over such decisions to an independent agency when the policy makers could be the ones to pay the political price for the agency’s decisions.

Solving the problems of alignment also includes persuading those who produce textbooks, digital media, and curricula to align them with standards. It would be no small feat to persuade the handful of large private firms that dominate textbook and test publishing to revise their products to fit with clear and lean standards. The original Common Core report envisioned groups of states combining to shape markets, using their joint purchasing power to get what they want. But such groups would require the capability to be clear about what they wanted and to judge whether they got it. State education agencies have never invested much in making decisions about content coverage; they have few or no staff expert in such matters, and many states never even decide among textbooks, leaving those decisions to local school districts.

The chief effort to deal with some elements of this problem appears to center on curriculum development by the two consortia that are devising assessments aligned with the Common Core, because the proposed assessments would be most usable if there were curricula that were consistent with the assessments. But federal law explicitly prohibits federal funding of curricula, which would seem to exclude curriculum development by the consortia or other agencies that receive federal funds.<sup>37</sup> In addition, states and localities have very limited capability to design and produce curriculum.<sup>38</sup> The current plan to cope with this dilemma seems to be for the consortia to “develop curriculum frameworks, model instructional units and such, not entire curricula. Those resources, along with others, would be housed in a digital library and made widely available, but no state or district would be obliged to use them.”<sup>39</sup> This strategy may deal with the statutory problem, but whether

it will manage the larger political or educational problems remains to be seen.

The third action that the Common Core initiative envisions is the creation of “more focused pre-service and professional development.”<sup>40</sup> Achieving this goal would require deep and broad change in higher education, or the creation of new nonuniversity teacher-education programs, or both. Roughly the same problems would arise in re-educating teachers already in the classroom: most of what is offered in current “professional development” courses is not grounded-in-practice know-how for teaching academic subjects. The problems that we outline here are not an argument against change, but a recognition of the difficulty that would be entailed in bringing about effective change, and how modest educators’ capability is. Meaningful improvement in teachers’ instructional capacities would require unprecedented and forceful intervention in markets, schools, and higher education.

The states’ fourth assignment in the Common Core plan is to “develop and implement an assessment system to measure student performance against the common core state standards.” Two state consortia have undertaken to develop assessments that fairly represent those standards, an assignment that is unprecedented in U.S. education.<sup>41</sup> Here again, although the Common Core is now at center stage, it is the states that will develop or sponsor the development of tests and use them to assess the extent to which their schools and students’ performance meet the standards. Presumably the states would then take steps to improve schools whose performance lags. Here, as with No Child Left Behind, the fifty state agencies that govern and operate public schools would assess their schools’ performance and

announce the results, strong and weak. But such self-assessment was one of the reefs on which No Child Left Behind foundered, and it is the sort of arrangement to which consumer advocates object when drug companies evaluate their own products. What criteria will states use to evaluate their schools’ performance, and who will set them? School resources and human capital differ greatly within and among states, and students’ scores on most tests will reflect those differences. Moreover, rigorous tests of deep reading comprehension, conceptual knowledge, and vocabulary would highlight more weakness in students’ performance than many conventional tests that stress procedural skills.

States could deal with these discrepancies in school resources and human capital through the ways in which they build the tests and frame and analyze the results. They could, for example, evaluate how well schools are doing by using value-added assessments, which report gains in individual student performance as the “value” that schools add to that individual performance. Although these measures have some technical problems, some of them would be addressed in an assessment system in which tests and curricula were consistent. Part of the appeal of value-added measures is that they are expected to de-emphasize the relationship between students’ scores and their families’ social and economic status, because they measure schools based on whether individual student performance improves and not on whether overall performance meets a mandated level. One nontechnical problem is how to decide how much added value is satisfactory, and how much is too little; if many states do use value-added measures to assess schools, this problem is sure to be central.

Alternatively, states could use assessments that are aligned with common standards, but, like No Child Left Behind, they could set different cut-off points, or test score thresholds, for determining achievement levels for acceptable work. That arrangement might preserve the appearance of commonality while enabling states to reduce the political damage and educational repair work that low scores bring. However, it would repeat some of the same problems that No Child Left Behind encountered and would doubtless provoke disputes about how much commonality had been lost. Test scores also could be adjusted for students' background and educational resources, moderating reports of their academic performance with evidence of social advantage and disadvantage. These are not the only alternatives, and each has strengths and weaknesses, but they illustrate the problems that await the analysis and reporting of assessment results, and their interpretation and influence.

However the assessments are analyzed and reported, they are supposed to lead to school improvement. What will be done when many schools and students are found wanting? What provision will be made to repair weak performance? Here again, states and localities with weak professional capacity will be responsible for the improvement of

weak schools. But practice can react back on policy: if state standards and assessments that are designed to improve schooling turn up large differences in student performance, states would have to either correct the problem or revise the measurement. If repairs were not forthcoming—that is, if practice appeared to persistently fail—the policy that drew attention to the problem and promised remedy could be at risk. In this eventuality, the Common Core would become the political and educational albatross that No Child Left Behind became, for roughly the same reason. If the Common Core is to succeed, then the need to devise and implement reliable ways to improve practice is acute.

That brings us to the most fundamental issue with the Common Core and the other reforms discussed in this article. Can educators and others mobilize the capability to help states and localities invent, adapt, and implement reliable ways to improve instruction? That question is especially significant in light of the Common Core's intention to promote intellectually deeper and more ambitious instruction. The Common Core could become an impressive departure from inherited school-improvement practice, but the question awaits an answer. The success of this enterprise—including but not limited to literacy instruction—will depend on it.

## Endnotes

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5. Sean Corcoran, “Long-Run Trends in the Quality of Teachers: Evidence and Implications for Policy,” *Education Finance and Policy* 2, no. 4 (2007): 395–407.
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9. For a detailed discussion, see David K. Cohen and Susan L. Moffitt, *The Ordeal of Equality: Did Federal Regulation Fix the Schools?* (Harvard University Press, 2009), pp. 130–92.
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11. Core Knowledge (CK) is another CSR model that requires common curriculum, among other elements of infrastructure, and evaluations report significant achievement gains for students in CK schools, although the research is not as rigorous as that of Rowan and others (see note 10). See Core Knowledge Foundation, *How Do We Know This Works? An Overview of Research on Core Knowledge* (Charlottesville, Va.: January 2004) ([www.coreknowledge.org/research](http://www.coreknowledge.org/research)).
12. For several perspectives on the CSR models, see Christopher Cross, ed., *Putting the Pieces Together: Lessons from Comprehensive School Reform Research* (Washington: National Clearinghouse for Comprehensive School Reform, 2004).



13. Mary Austin and Coleman Morrison, *The First R: The Harvard Report on Reading in Elementary Schools* (New York: Macmillan Publishing, 1963); James Baumann and others, “*The First R* Yesterday and Today: Elementary Reading Instruction Practices Reported by Teachers and Administrators,” *Reading Research Quarterly* 35, no. 3 (2000): 338–77.
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15. Teach for America, “Teach for America Adds Largest Number of New Teachers and Regions in 20-Year History,” May 28, 2009 ([www.teachforamerica.org/newsroom/documents/20090528\\_Teach\\_For\\_America\\_Adds\\_Largest\\_Number\\_of\\_Teachers\\_in\\_History.htm](http://www.teachforamerica.org/newsroom/documents/20090528_Teach_For_America_Adds_Largest_Number_of_Teachers_in_History.htm)).
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21. Hill, “Evaluating Value-Added Models” (see note 18).
22. Chetty, Friedman, and Rockoff, “The Long-Term Impacts of Teachers” (see note 20).
23. See, for example, Robert E. Wilson, Michael J. Bowers, and Richard L. Hyde, *Report to the Governor on Test Tampering in Atlanta Public Schools*, 3 vols., June 30, 2011 ([www.ajc.com/news/volume-1-of-special-1000798.html](http://www.ajc.com/news/volume-1-of-special-1000798.html)); B. Jacob, “Accountability, Incentives, and Behavior: Evidence from School Reform in Chicago,” *Journal of Public Economics* 89 (5–6): 761–96.
24. These schemes could shape incentives in classrooms. Teachers cannot produce learning without learners’ active engagement. Can teachers fairly be held accountable for what students do not learn if students are not accountable for their learning and if they resist or slacken? If yes, the assumption is that teachers can control students’ motivation, an assumption we reject. Teachers can influence students’ motivation, and exerting that influence in ways that advance learning is an important element of teachers’ craft, but students are not automatons; their will is their own. Once students learn that they can influence teachers’ fates, unusual incentives could be created. Not to take these aspects of merit pay seriously would be

roughly comparable, in health care, to designing systems to hold doctors accountable for whether patients take their medicine, follow instructions, and get well.

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27. Steven F. Wilson, “Success at Scale in Charter Schooling,” Future of American Education Project Working Paper 2008-02 (Washington: American Enterprise Institute, 2009) ([www.aei.org/outlook/education/k-12/success-at-scale-in-charter-schooling](http://www.aei.org/outlook/education/k-12/success-at-scale-in-charter-schooling)).
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29. Council of Chief State School Officers, “Common Core State Standards Initiative” (Washington, 2009), p. 7.
30. Ibid.
31. Catherine Gewertz, “State School Boards Raise Questions about Standards,” *Education Week*, February 3, 2010 ([www.edweek.org/ew/articles/2010/02/03/21nasbe.h29.html?tkn=SZBFYyo9k83lnCjVJTph2BWpC7jrtP4ouTe8](http://www.edweek.org/ew/articles/2010/02/03/21nasbe.h29.html?tkn=SZBFYyo9k83lnCjVJTph2BWpC7jrtP4ouTe8)). The story also pointed out that “some thought that ... states could craft a set of standards with 85 percent of the common standards and 15 percent of their own. But NGA and CCSSO officials said that states must approve the entire common-standards document verbatim. They may choose to add 15 percent of their own material. How that 15 percent would be measured remains an open question.”
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33. National Governors Association and Council of Chief State School Officers, “Common Core State Standards Initiative Frequently Asked Questions” ([www.corestandards.org](http://www.corestandards.org)).
34. Ibid.
35. Maria Glod, “46 States, D.C. Plan to Draft Common Education Standards,” *Washington Post*, June 1, 2009.
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39. Gewertz, “State School Boards Raise Questions about Standards” (see note 31).
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41. Alyson Klein, "Duncan Unveils Details on Race to the Top Aid," *Education Week*, June 15, 2009, [www.edweek.org/ew/articles/2009/06/15/36duncan.h28.html](http://www.edweek.org/ew/articles/2009/06/15/36duncan.h28.html).

# Technology Tools to Support Reading in the Digital Age

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*Gina Biancarosa and Gina G. Griffiths*

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## Summary

Advances in digital technologies are dramatically altering the texts and tools available to teachers and students. These technological advances have created excitement among many for their potential to be used as instructional tools for literacy education. Yet with the promise of these advances come issues that can exacerbate the literacy challenges identified in the other articles in this issue.

In this article Gina Biancarosa and Gina Griffiths characterize how literacy demands have changed in the digital age and how challenges identified in other articles in the issue intersect with these new demands. Rather than seeing technology as something to be fit into an already crowded education agenda, Biancarosa and Griffiths argue that technology can be conceptualized as affording tools that teachers can deploy in their quest to create young readers who possess the higher levels of literacy skills and background knowledge demanded by today's information-based society.

Biancarosa and Griffiths draw on research to highlight some of the ways technology has been used to build the skills and knowledge needed both by children who are learning to read and by those who have progressed to reading to learn. In their review of the research, Biancarosa and Griffiths focus on the hardware and software used to display and interface with digital text, or what they term e-reading technology. Drawing on studies of e-reading technology and computer technology more broadly, they also reflect on the very real, practical challenges to optimal use of e-reading technology.

The authors conclude by presenting four recommendations to help schools and school systems meet some of the challenges that come with investing in e-reading technology: use only technologies that support Universal Design for Learning; choose evidence-based tools; provide technology users with systemic supports; and capitalize on the data capacities and volume of information that technology provides.

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Technological advances are dramatically altering the texts and tools available to students and teachers. Since 2007, the number of devices available for displaying digital text has increased exponentially.<sup>1</sup> The first e-reader to take hold in the market, the Amazon Kindle, sold out two days after it was released in November 2007.<sup>2</sup> By June 2011, Amazon reported selling more Kindle books than hard- and soft-back books combined.<sup>3</sup> Meanwhile, the first large-scale release of a touchscreen tablet, the Apple iPad in April 2010, further expanded options for readers to access digital-text media with its inclusion of the application “iBooks.”<sup>4</sup> By the time the iPad 2 was released in March 2011, more than 15 million units had already sold, and by June 2011 that number was 27 million.<sup>5</sup> Analysts forecast that 89.5 million units, including both tablets and e-readers, will sell worldwide in 2014.<sup>6</sup>

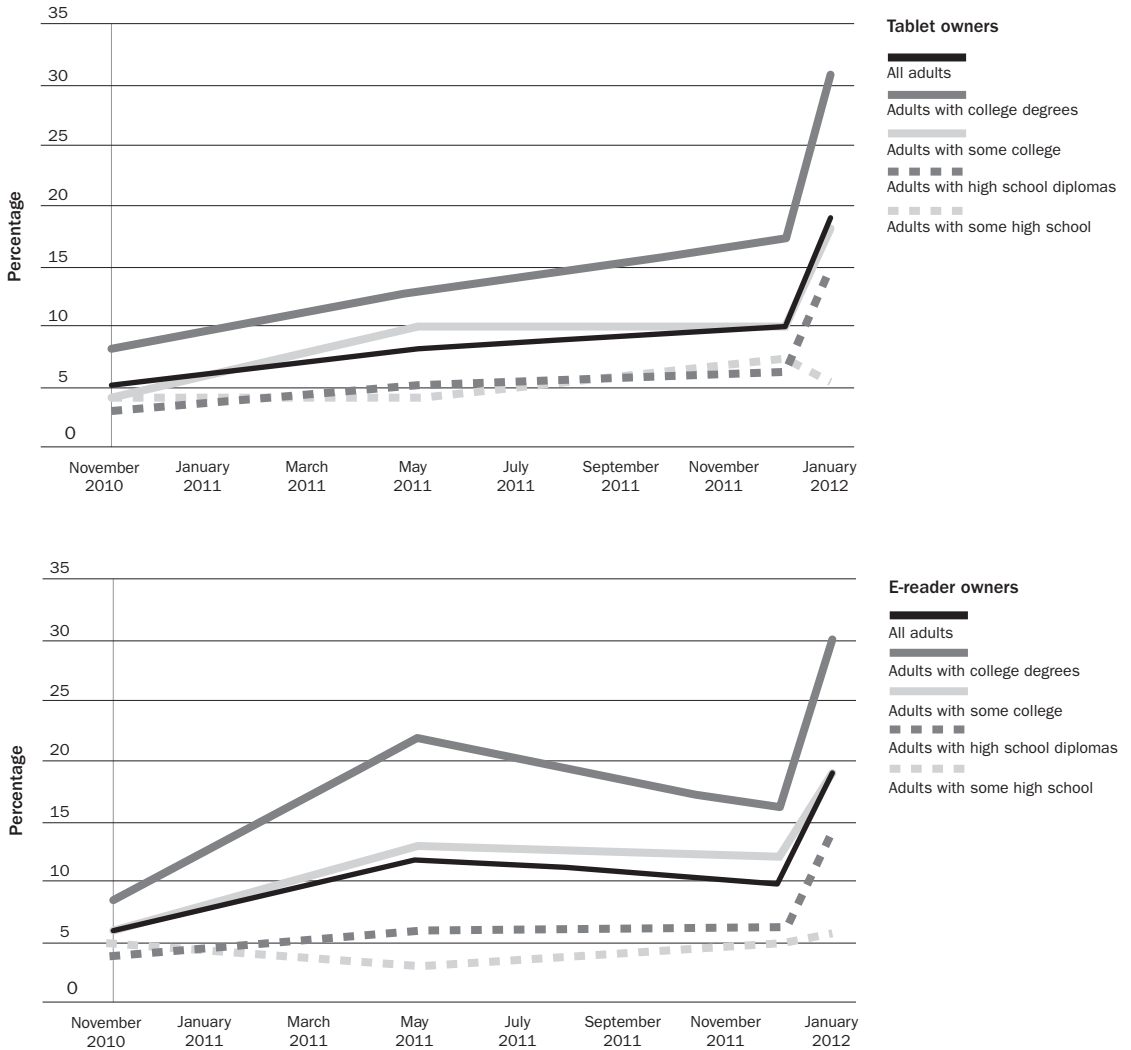
These technological advances have created high hopes among many teachers, administrators, researchers, and policy makers, who believe that the digital devices offer great promise as instructional tools for literacy education. Simple applications of existing e-reading technology such as changing font size on-screen, using text-to-speech features to provide dual input of text, or using the Internet to collaborate on learning activities may substantially improve the learning of many students.<sup>7</sup> At the 2011 annual International Conference on Computers in Education, researchers from around the world met to exchange ideas on more-advanced uses of e-reading technology, ranging from providing individualized feedback through artificially intelligent animated avatars, to fostering critical thinking skills through computer-supported collaboration, to predicting students’ interest or frustration

based on brain-wave signals and mouse-click behavior.<sup>8</sup>

Yet with the promise of these advances come issues that can further exacerbate the literacy challenges that are identified in other articles in this volume, such as gaps in the literacy skills of students of different socioeconomic status. Nonie Lesaux, for example, highlights the importance of higher-level conceptual skills and knowledge for literacy, and she stresses the need to narrow gaps in those areas by providing all students with adequate opportunities to develop such knowledge.<sup>9</sup> The new e-technology, however, may inadvertently widen such gaps. Parents, for example, increasingly use technology to provide their children with learning and reading opportunities—and today’s parents are the fastest-growing population of consumers purchasing e-reading technology. But parents are not equally able to provide those opportunities for their children.<sup>10</sup> As figure 1 depicts, ownership of tablets and e-readers is surging, with sales doubling over six months in 2011 and doubling again in the final month of 2011.<sup>11</sup> But as figure 1 also illustrates, purchasing patterns indicate a widening education-based gap in access, a gap that also exists when purchasing patterns are disaggregated by income level.<sup>12</sup> The resulting technology gap closely resembles the demographically based literacy-skills gap outlined in the article in this issue by Sean Reardon, Rachel Valentino, and Kenneth Shores, thus raising the worrisome possibility that new technologies for developing literacy skills will pose further difficulties for students from low-income families.<sup>13</sup>

And even if policy makers and educators address gaps in access to technology, experts warn that achievement disparities may continue to widen unless students are given

Figure 1. Changing Percentages of Tablet and E-reader Ownership by Education Level



Sources: Pew Internet and American Life Project.

sufficient opportunities to learn how to use the technology to accomplish a wide range of goals. Although demographic gaps in access to technology at home are being narrowed by students' improving access at schools, libraries, and community technology centers, serious gaps remain in students' ability to use technology in sophisticated ways.<sup>14</sup> High-achieving students are not only more likely to use technology for interest-driven activities

such as researching topics or collaborating online to create new media, but are also more likely to have adult guidance in its use.<sup>15</sup> Lower-achieving students are more likely to use it for socially driven activities such as chatting or playing games with friends using social media, following pop-ups, or surfing through links of celebrities and sports figures.<sup>16</sup>



Such differences in the way students use technology may not only do little to shrink knowledge gaps, but may in fact exacerbate them. Students need more than access to technology; they need to learn how to apply it strategically to advance their literacy skills—especially the conceptual and knowledge-based capacities that become crucial in later literacy tasks. In her article in this issue, Susan Goldman describes how having to navigate vast amounts of unfiltered information at various levels of complexity and in different forms can complicate learning for students who are already struggling to master strategic approaches to reading and critical thinking skills.<sup>17</sup>

Although the need for students to master literacy skills and knowledge is not new to the digital age, the urgency of that need is amplified by technology. The question is not the narrow one of how to fit technology into literacy education, but the broader one of how to transform literacy education to meet today's changing demands.

The good news is that technology can be a tool for mitigating many literacy challenges. It is already being used in new and promising ways to address the full range of skills, both procedural and conceptual, required for improving student literacy. That is, technology can be more than a tool for drilling students on skills; it can be a tool for acquiring the vocabulary and background knowledge essential to becoming a skilled reader. Although technology is no panacea for literacy problems, it can be part of the solution. For its promise to be realized, however, its tools must be embedded strategically within cohesive, evidence-based educational programs.

In this article we examine how teachers are using reading technology to address

the literacy challenges highlighted in other articles in this issue. Though many early literacy technologies have thus far focused on basic reading skills, we explore how technology can build knowledge and support higher-level reading strategies and behaviors. We address key systemic issues facing educators and policy makers in their efforts to make reading technology a tool for improving literacy rather than yet another source of inequity, and we conclude with recommendations about how to maximize the benefits of investments in e-reading technology tools. We begin by clarifying terminology.

### Defining E-reading Technology

In both popular media and research, terms such as e-book, e-reader, e-text, and tablet are not always clearly and consistently differentiated and are often used interchangeably. The lack of clarity in part reflects the rapid advance of technology, with newly released options almost immediately being modified or merged together with other options. Such change contributes to confusion as distinguishing features become vague or obsolete.

This slippery terminology can be perplexing for educators, parents, and policy makers who need to make well-informed decisions about these technologies. Although we focus on the digital text, we note, as Goldman indicates in her article in this volume, that it is often augmented by other digital media and so is increasingly difficult to isolate from other media.

In this article, we use e-reading technology to refer to the hardware and software used to display and interface with digital text. Hardware includes devices, such as e-readers and tablets, as well as smartphones, laptops, and even desktop computers, that display digital text. Software includes a range of

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applications and programs that allow readers to interact with the text, either locally on the device or over a network; it may or may not include instructional features. Although many forms of e-reading technology may be used for more than reading, we focus on the technology's role in literacy instruction. And although many other technologies, including audio players, video players, interactive whiteboards, and clickers, may be used for literacy instruction, they cannot store and display digital text.<sup>18</sup> We confine the term e-reading technology to those that can. Nascent research on these other technologies, although promising, is thus beyond the scope of this article.<sup>19</sup>

Using such a broad term makes it hard to draw generalized conclusions from research, because each device and application has specific features and limitations. Thus, claims made about one form of e-reading technology with specific features may not apply to another form. For example, when researchers conduct an efficacy study using tablets with a specific instructional application, it may not be possible to generalize their findings to smartphones or laptops, even with the same application, not least because of the vast differences in screen size.

## **Research on E-reading Technology as a Tool**

Today educators are in the precarious position of having to respond to the many new e-reading options for curriculum and teaching practices with virtually no empirical guidance on how to do so in a way that supports learning. Most research as yet is small-scale in nature, focusing on feasibility and efficacy in tightly controlled contexts rather than on wide-scale use. We review a variety of small-scale research studies on e-reading technology as a tool for improving literacy outcomes, and then look at two large-scale studies and offer a final cautionary note about the overall lack of a consistent or large-scale body of evidence on e-reading technology.

### **Tools for Compensation and Instruction in Basic Skills**

E-reading technology has shown promise in developing early reading skills and in giving readers with visual impairments or language-based disabilities access to texts. One of its most widely used features is text-to-speech, in which either a human or computer-generated voice reads digital text aloud for users. Sometimes synchronized highlighting of the text draws readers' attention to the word or words being read aloud.

The research is relatively robust on the benefits of text-to-speech for readers with impairments that might otherwise preclude equal access to text and for young readers still acquiring basic skills like phonological awareness or decoding.<sup>20</sup> Also promising are recent innovations in text-to-speech involving the translation of visual information other than text, such as pictures or tables.<sup>21</sup>

Ofra Korat has been conducting experimental studies with e-reading tools that can build both procedural skills (such as phonological

awareness and word reading) and conceptual skills and knowledge (such as vocabulary) that foster learning to read. She has found that presenting children's books as digital text with dictionaries or activities can lead to improvements in phonological awareness, word-reading skills, and vocabulary knowledge for kindergarten and first-grade readers.<sup>22</sup> Other studies with younger children indicate that presenting high-quality children's books on computers with multimedia supports, such as the text being read aloud expressively with simultaneous highlighting of the words being read, helps to improve children's focus on and subsequent recognition of words from the text, as well as their vocabulary.<sup>23</sup>

Others have investigated the use of similar e-reading technology tools to provide practice opportunities and individualized feedback for struggling and impaired readers and found promising results.<sup>24</sup> Richard Olson and his colleagues provide further evidence that struggling readers in grades two to five can benefit from programs that provide individualized e-reading practice opportunities in story reading, comprehension strategies, and phonological analysis.<sup>25</sup> Another strand of research, which has focused on embedding multimedia practice opportunities into e-reading technology that can be sent home with students, finds that the technology increases children's, especially at-risk children's, practice at home.<sup>26</sup> One small-scale study found that children from lower socioeconomic backgrounds benefited more from such opportunities than did more-advantaged children and that they made greater gains in both word-recognition skills and vocabulary knowledge, thus suggesting that e-reading technology could be useful for closing both procedural and conceptual skill gaps in literacy.<sup>27</sup>

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Research with somewhat older readers has also found positive results of e-reading technology for a range of reading skills, including fluency, vocabulary, and comprehension. Jack Mostow and his colleagues at Carnegie Mellon University have developed a computer-guided reading tutor that builds readers' fluency and comprehension using speech-recognition to give spoken and graphical feedback as students read instructional texts aloud.<sup>28</sup> They have also found that second-language readers show improvements in fluency and spelling skills comparable to or greater than those obtained with English as a Second Language instruction alone.<sup>29</sup> A similar program called Scientific Learning Reading Assistant has also generated evidence that speech-recognition applications within e-reading programs can improve oral reading fluency skills in second- through fifth-grade readers.<sup>30</sup> Finally, a synthesis of the research on e-books, defined as digital texts that mimicked print texts (for example, having pages that turn), has found small positive effects for prekindergarten to fifth-grade students' comprehension-related outcomes.<sup>31</sup>

### **Tools for Supporting Strategic Readers**

Innovative technology applications also show promise for supporting the development of advanced reading skills that students need to master discipline-specific knowledge areas and that may be particularly challenging for students from low socioeconomic backgrounds and non-English-speaking homes. Self-paced tutorials have led to gains in self-questioning, error detection, inference, summarization, and concept-mapping skills and strategies to enhance readers' use of reading strategies and comprehension of texts. Two online interventions, Computer Assisted Strategy Teaching and Learning Environment and Improving Comprehension Online, have both shown positive effects in these skill areas in quasi-experimental studies. Sixth graders using Computer Assisted Strategy Teaching and Learning Environment outperform controls in application of the targeted strategies. Benefits can depend on genre, with treatment students outperforming on expository versus narrative texts or vice versa depending on the strategy under consideration.<sup>32</sup> Monolingual and bilingual fifth-graders using Improving Comprehension Online have shown improvement relative to control students on norm-referenced and research-developed measures of vocabulary.<sup>33</sup> Students in grades six through twelve have largely endorsed online tutors and self-paced tutorials as desirable features of e-books.<sup>34</sup>

Experimental evaluation of instructional agents—generally, animated avatars that respond to student input in digital text or human or computerized voices—has demonstrated particular benefit for boosting vocabulary, identifying inferences, developing metacognitive awareness regarding understanding, and learning appropriate strategies.<sup>35</sup> The instructional agents respond with

clear, immediate, and individual corrective feedback that mimics teachers but on a scale that individual teachers cannot hope to replicate, thus improving a teacher's ability to provide just-in-time individualized support to an entire class of diverse students. Moreover, these agents have become increasingly sophisticated over the past decade, and some can now respond to spoken natural language.<sup>36</sup> Digital delivery of graphic organizers that provide readers with a structure for strategically interacting with the text has also been shown to improve comprehension.<sup>37</sup>

### **Tools for Building Knowledge and Supporting Reading to Learn**

Digital text gives educators access to tools that allow more flexibility regarding content selection and layout of the text, as well as the means to modify content based on the particular needs of students and local communities. The use of ancillary materials such as original source documents and alternative multimedia presentations of information has helped compensate for struggling readers' limitations in background knowledge and has enriched learning opportunities for all readers.<sup>38</sup> For example, teachers can use online multimedia resources from respected sources, such as PBS and National Geographic, to augment their presentation of new content to all students and as a tool to build background knowledge for students who lack it.<sup>39</sup>

Manipulable embedded graphics have been associated with improved outcomes in science learning and have also been shown to support iterative conceptual development, allowing students, for example, to interact with a graphic or even an animated representation of repeated random sampling to understand the Central Limit Theorem, a foundational but difficult-to-grasp concept in statistics.<sup>40</sup>

Online learning communities can also support individualized pursuit of learning interests beyond the classroom.<sup>41</sup> Innovative work using chat functions allows students to collaborate and interact to solve online problems.<sup>42</sup> Connections to digital repositories enable students to access authentic source materials such as scanned original letters exchanged between writers of the Declaration of Independence or recorded speeches by public figures such as Martin Luther King Jr.<sup>43</sup>

Positive outcomes for improving background knowledge, strategic use of technology, and innovative applications of technology have also been shown in evaluations of Community Technology Centers, community-based services located in independent facilities or embedded in public libraries and after-school programs such as Boys and Girls Clubs.<sup>44</sup> These centers provide students access to a variety of up-to-date equipment and high-speed Internet access that, coupled with workshops and mentoring from staff, allow the youth to learn to use technology for a variety of purposes.<sup>45</sup>

### **Tools for Individualizing Supports**

Other articles in this issue explore how disparities in students' skills and knowledge, combined with reading and learning impairments, complicate the task of improving literacy outcomes for all learners. Teachers charged with delivering differentiated instruction to meet the individualized needs of learners must often do so by trying to retrofit a one-size-fits-all curriculum—to meet the needs of diverse learners—a cumbersome and time-consuming process.<sup>46</sup> Moreover, unless carefully designed, e-reading technology itself can replicate the problem, thus reproducing old barriers and generating new ones that marginalize diverse learners.

CAST (originally the Center for Applied Special Technology) uses an approach called Universal Design for Learning (UDL) to design e-reading technology that attempts to meet the needs of individual learners by assuming and taking into account their diverse needs.<sup>47</sup> A key aspect of UDL is to provide multiple ways both for students to gain knowledge and skills and also for them to express and apply that knowledge. In the case of e-reading technology, tools like text-to-speech, automated tutors, and individualized levels of support are built into e-reading applications from the beginning rather than being added later. Although the concept of UDL itself is not new, technological advances increase the feasibility of providing a wide range of supports to meet the needs of every learner. Research on matching students to technologies is still at an early stage.

### **Tools for Assessment**

E-reading technology, particularly its instructional applications, often incorporates mechanisms for gathering data on students. The data may be restricted to use patterns, such as frequency and duration of use, or it may extend to assessment of learning by incorporating placement and mastery assessments. Because studies of e-reading instructional tools have not examined whether they are as effective with assessment as without it, we review briefly a few examples from the wide and increasing range of technological innovations for literacy assessment. Because space does not permit a full discussion of these innovations, we must overlook important ones such as clickers, automated scoring of written and spoken answers, and innovative assessments of higher-level comprehension skills.<sup>48</sup>

One of the most popular tools for assessment in literacy (and beyond) has been



computer-adaptive testing (CAT). Regarded as an innovation a decade ago, CAT has become a mainstay of large testing firms. The Educational Testing Service regularly uses it for online tests, and reading achievement tests, including the Computer Based Assessment System for Reading, Measures of Academic Progress, Scholastic Reading Inventory, and STAR Reading, are increasingly available in online CAT formats. Many states, including Florida, Maryland, and Oregon, have invested in online CAT systems for one or more state accountability tests. What CAT offers is an assessment that adapts to the test-taker. Students who answer questions correctly are given questions of increasing difficulty, while students who respond incorrectly are given questions of decreasing difficulty. Each student thus completes a large number of items at her or his difficulty level, leading to a more precise estimate of the underlying ability being assessed. Although some observers have raised concerns that early careless errors may lead to underestimates of student abilities, recent evidence suggests that such underestimation is rare and occurs primarily for students of very high or very low ability.<sup>49</sup>

The turn to computerized delivery of assessments has raised concerns that such assessment, adaptive or not, might pose particular difficulties for anxious test-takers or those with less computer experience. Although evidence is limited, comparisons of adults taking the GRE suggest that anxiety is a strong predictor of performance and that computing confidence is a weak but significant predictor—but also that neither depends on the format in which a test is delivered.<sup>50</sup> Other research with adults suggests that older adults may comprehend less and read less efficiently using computer screens than using paper, whereas younger adults show no difference.<sup>51</sup> Studies with intermediate, middle, and high school

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students have had mixed findings. Two indicate that the medium of test administration does not significantly alter results, but a third finds that computerized tests take longer to complete but yield significantly higher scores.<sup>52</sup> In assessments of writing, by contrast, greater familiarity with computers predicts better performance even when paper-based writing ability is taken into account.<sup>53</sup>

More recent innovations in assessment have involved hand-held devices on which teachers record assessment information, ranging from scores alone to item-level student responses. In many cases, companies offering applications for these devices have adapted pre-existing assessments, such as Wireless Generation's adaptation of the Dynamic Indicators of Basic Early Literacy Skills. Others have developed unique measures for hand-held devices and have created applications for teachers to record data from their own self-created formative assessments, but research on the effects of these approaches is lacking.<sup>54</sup>

Assessment through e-reading technology may soon become standard practice. The U.S. Department of Education has invested heavily in developing online assessments, funding two large multistate consortia to develop assessment systems aligned to the Common



Core State Standards—the Partnership for the Assessment of Readiness for College and Careers and the SMARTER Balanced Assessment Consortium. Two smaller consortia, the Dynamic Learning Maps and the National Center and State Collaborative, focus exclusively on assessments for students with special needs. The assessments developed by all four of these consortia will be delivered online and are due for initial implementation by the 2014–15 academic year.

### Large-Scale Studies: A Cautionary Note

Although e-reading technology offers real promise for improving literacy outcomes, evidence of its effectiveness is relatively limited. As of early 2012, out of 321 literacy-intervention programs reviewed by the What Works Clearinghouse over a decade, only thirteen relied on e-reading technology to some extent.<sup>55</sup> Of these, six were deemed to have at least potentially positive effects with no overriding contrary evidence, but both the number of studies of the six interventions and the overall sample sizes for each were generally small. Only Read 180 in grades four through nine and SuccessMaker in grades four through ten had a medium to large research base; both had small positive effects on reading comprehension.<sup>56</sup>

In fact, only two large-scale studies of e-reading technology tools have been conducted as of early 2012; thus we review them in detail here. Both provide sobering evidence that should temper excitement about rapidly advancing technological innovations and thus emphasize the importance of explicitly and thoroughly evaluating effectiveness, as well as the importance of considering what promotes full implementation.

In 2009, the Institute for Educational Sciences released findings from a federally funded

randomized control study that investigated the effectiveness of ten reading and mathematical software programs used in first- and fourth-grade classrooms.<sup>57</sup> Researchers measured outcomes by comparing student scores on state-mandated standardized tests in classrooms where the programs were integrated with the curriculum with scores in classrooms where the programs were not used. Only one reading program resulted in statistically significantly improved outcomes in fourth grade, and these effects were small and not evident until its second year of use. None of the other reading or math programs led to significant differences in scores when compared with the “business as usual” instructional programs.<sup>58</sup>

In another federally funded, large-scale, randomized control trial published in 2011, researchers investigated Thinking Reader—an e-reading computer program for nine children’s novels that provides instruction, guided practice, and feedback to readers at one of five teacher-chosen individualized levels of support. The study compared outcomes of sixth-grade students who participated in the intervention with those of control students who received regular instruction and found no significant differences.<sup>59</sup>

In short, the two studies provide no evidence that large-scale implementation of e-reading technology improves educational outcomes. But they do raise issues that should be addressed in ongoing research into the effectiveness of the technology. The first study, for example, evaluated programs that used very different approaches to instruction, making it unclear whether the failure to find effects for most programs was attributable to the technology or to the instructional approach. Nor was it clear whether the

programs under study were complementary to and connected with daily instruction in treatment classrooms—a particularly important consideration in making sustained, purposeful, and effective use of the technology to improve reading. Neither was it clear how faithfully the programs were implemented in the intervention classrooms. Because schools and districts were selected precisely for their inexperience with such tools, lack of experience and discomfort with technology may also have contributed to the predominantly null findings.

The Thinking Reader study raised another important issue by gathering data on how students used the program. It found that the frequency of use was nowhere near suggested levels—about 60 minutes a week rather than the recommended 110 to 165 minutes. And although Thinking Reader designers recommend that students participating in the program read multiple novels, the study found that by the end of the school year, 12 percent of students had not even begun a novel, 20 percent had not finished their first novel, 31 percent had completed only one, and only 7 percent had completed a third.

One explanation for the failure of large-scale studies to find evidence that e-reading technology is effective may thus be that positive outcomes depend as much on genuinely engaging teachers and their students in the use of e-reading tools as on the availability of the technology itself. Whereas efficacy trials of programs and devices tend to target eager users by default, generating positive outcomes in large-scale studies and in the field may require more concerted attention to how these tools can be made appealing and useful to less-than-optimally eager and knowledgeable users.

## **Practical Challenges to E-reading Technology Use**

Maximizing the potential benefits of e-reading technology also poses practical challenges. To realize fully the technology's promise, schools will need to buttress infrastructural supports, including professional development for teachers, systems for upgrading and maintaining technology, and efficient and secure data systems.

## **Professional Development**

Technology has made its way so quickly into so many facets of modern life because of its utility. Being able to pay bills, order clothing, send a message to a friend, and read a newspaper article within less than an hour and without leaving home is appealing to many people. The technological advances that have made their way into education have done so for the same reason. The overhead projector enabled teachers to share information more efficiently with their classes while interacting with students more directly. The scientific calculator allowed students to learn more advanced math and science concepts by using more efficient methods of calculation. Teachers and parents now routinely communicate by e-mail. For e-reading technology to realize its promise fully, it must be genuinely useful to both the teacher and the student.

All too often, integrating technology into education has meant simply adding it to the existing curriculum and pedagogy, thereby limiting its usefulness for teaching and learning. Rarely is technology an organic part of a lesson plan, especially as more and more requirements to administer in-class accountability tests absorb already-limited class time. According to Project Tomorrow 2010, the educators who see technology as being important to a district's core purpose are those who are farthest from daily

engagement with students. Some 60 percent of district administrators and 55 percent of school principals endorsed the idea of technology's importance, but only 38 percent of teachers and future teachers did so.<sup>60</sup> In fact, educators often view technology skills not so much as a means for advancing learning and supporting instruction, but as just one more item on the list of things that students must learn, that teachers must make time to teach, and that administrators must squeeze into an already overly restrictive budget.<sup>61</sup>

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*Teachers most commonly report that what prepared them to make effective use of technology for instruction was not training, but independent learning.*

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Not surprisingly, when researchers surveyed schools that had high access to, but low use of, technology, they found that teachers had limited time to find and evaluate software; that computer and software training was inconveniently timed or was too generic and not specific to the needs of teachers; and that most teachers were using the technology without fundamentally changing their instructional strategies to take full advantage of it.<sup>62</sup> In addition, the most recent federal survey of teachers' use of technology found that although many use it for record-keeping, relatively few use it for instruction. Generally speaking, teachers in schools serving large numbers of low-income students use technology less for instruction than do teachers in schools serving fewer such students, except to

teach or provide practice in basic skills.<sup>63</sup> Most important, two-thirds of teachers reported little to no technology-related professional development in the preceding year.

For teachers to see e-reading technology as useful, they need help adjusting to and capitalizing on the changing technological landscape. They need not only to see the potential benefits for themselves and their students, but also to be able to build the knowledge and skills to realize these benefits and to have opportunities to collaborate and innovate with colleagues to develop and integrate best practices.<sup>64</sup> The extent to which an individual teacher uses technology depends on how long it takes to learn to use it, how convenient it is to interact with it, and how well the technology interacts with other devices. If technology is to be used in the schools, it must offer user-friendly and intuitive interfaces, portability of content between devices, and timely, skilled response to technical challenges both by developers and by schools. Ongoing professional development, including training and testing of new technology as it becomes available, helps accelerate the learning curve for teachers, so that they can focus on using these tools to improve instruction.

Evidence on the best approaches to and efficacy of professional development in support of e-reading technology use, however, is in short supply. Teachers most commonly report that what prepared them to make effective use of technology for instruction was not training, but independent learning.<sup>65</sup> Indeed, some have argued for a coaching or mentoring approach to professional development in using educational technology effectively, with development focused on problems of practice.<sup>66</sup> But, again, evidence about how

effective coaching models are in professional development of that sort is minimal,<sup>67</sup> although some research does suggest that coaching models in literacy instruction more broadly improve literacy outcomes for students.<sup>68</sup>

### **Equipment and Systems Upgrades and Maintenance**

As options for using e-reading technology for educational purposes proliferate, school systems are struggling to provide equitable access to e-reading devices, texts, and appropriate technological supports. A system of governance that needs to protect limited funds faces the need to continually upgrade technological supports and infrastructure. Meanwhile students across demographic categories report that the available technology resources at school are unsophisticated.<sup>69</sup>

The unprecedented rate of technological change can create a sense of urgency to adopt the latest innovation without attending to how new tools affect students, teachers, professional development, and infrastructure systems. For example, schools frequently lack the advanced hardware and Internet bandwidth needed to use the most innovative software, applications, and web pages.<sup>70</sup> Although e-mail and most web browsing require only 50 kilobytes per second (kbps), television-quality streaming video requires 250 kbps, and interactive videos require 300 kbps.<sup>71</sup> And these requirements are for each user. Indeed, the Consortium for School Networking estimates that an 800-student high school with 50 faculty and staff needs 7.45 megabytes per second to handle expected traffic.<sup>72</sup> Schools must keep pace with the ever-increasing processing and bandwidth demands so that they can not only leverage the latest e-reading technology, but also keep abreast of the changing workplace

and real-world technological demands as they prepare their students for life after school.

### **Data Accessibility, Usability, and Security**

E-reading technology offers educators time-efficient tools for gathering, accessing, and interpreting data needed to produce the assessments essential to decision making. Used effectively, electronic assessments can minimize the time teachers need to take away from instruction and practice and maximize the timeliness of the information they use to tailor instruction to students' individual needs. Technology offers administrators and policy makers multiple coordinated data sources to improve their understanding of their education systems. And it can enrich research efforts to investigate the match between students and services and how they evolve over time.

Two types of systems capture information. Learning management systems deliver instructional content to users, whether students engaged in reading or other learning tasks or teachers engaged in professional development. These record-keeping systems usually track learners' engagement with content as well as their performance on linked content-related assessments. By contrast, student information systems offer a database approach to keeping track of a wide range of student information, including assessment scores, grades, schedules, attendance, and more—a modern alternative to the filing cabinets that historically have lined the walls of school and district central offices.

Although developers of both types of tools have tried to build efficiencies into the systems, teachers and other educators often receive little training in how to use them, particularly in the service of improved instruction. Despite developers' clear

recommendations to include end users in implementation plans, a mere 30 percent of surveyed school information-technology leaders reported that teachers were represented on core implementation teams, and an even smaller share reported demonstrating how to integrate tools into instruction and assessment.<sup>73</sup> Although school and district leaders generally believe training for teachers is adequate, teachers report that it does not match their daily needs for aligning instruction to assessment results.<sup>74</sup>

Student data in particular raise issues of protecting student safety, well-being, and civil rights. Students and their parents should have choices about what data is collected, how it is used, and with whom it is shared. The Federal Education Rights and Privacy Act of 1974, which was enacted to protect student privacy, does not yet adequately address the increased risks to privacy associated with Internet connectivity.<sup>75</sup> School systems will therefore also need to bolster and improve online security on an ongoing basis to keep up with threats to student privacy.

## Policy Recommendations

Despite the limited evidence base for the effectiveness of e-reading technology, it is nevertheless possible to suggest specific policies to help schools use the technology to support improved literacy outcomes for all students. The following policy recommendations are informed not only by the research base, but also by discussion with authors and editors of this issue of the *Future of Children* and with a panel convened by the Carnegie Corporation of New York that included representatives of educator advocacy groups, reading researchers, educational publishers, and e-reading technology developers. We thus make the following four recommendations based on collaborative, grounded

discussions on how to capitalize on the promise of e-reading technology as well as on the research to date.

Our first recommendation is that school systems should insist on e-reading technology that incorporates Universal Design for Learning. Only technology that supports UDL is flexible enough to fulfill one of e-reading technology's core promises: helping teachers support diverse learners. Although several e-reading technology applications already incorporate many UDL features, those features are not yet universally available and often are limited to text-to-speech. And while text-to-speech has by far the most research supporting its efficacy, it cannot by itself meet the full range of learner needs. Policy makers should require that funds devoted to e-reading technology be used only for devices and programs that support UDL and have the capacity to individualize support features. Specific criteria and procedures for complying with UDL are available from the National Instructional Materials Accessibility Standard and the National Center on Universal Design for Learning.<sup>76</sup>

Our second recommendation for schools is to choose evidence-based tools. Because e-reading technology is proliferating and diversifying so rapidly, research evidence will necessarily lag behind innovations. Thus, choices of e-reading technology tools must be guided by research both on the technology itself and on effective instructional practices. The research on e-reading technology that we have reviewed relies heavily on practices with an extant pretechnology research base—for example, explicit instruction, modeling, and guided and independent practice opportunities. For small investments in e-reading technology, an evidence base that is not rooted in the technological application



may be sufficient. But for large investments, school systems should require independent scientific evidence of effectiveness or, when that is not possible, arrange for researchers or third-party evaluators to study the technology's effectiveness as soon as it first is implemented. Policy makers should be very cautious when considering investments in innovative practices, such as virtual learning environments, that were not possible before e-reading technology. Meanwhile, federal and private grant makers should encourage precisely such innovation, always incorporating research on effectiveness.

Our third recommendation is that schools provide systemic supports. To use e-reading technology tools effectively, teachers need adequate and consistent systemic support, such as formal school-based information-technology teams. These teams should be familiar not only with the technology, but also with how it should be used within the curriculum and how to support teachers and others who use it. Technical support should include regularly scheduled updates and servicing to ensure security and prevent problems; it should also give teachers rapid response to troubleshooting requests. Policy makers and administrators should consult organizations such as the Consortium of School Networking and State Educational Technology Directors Association for up-to-date advice and estimates on infrastructure and costs associated with supporting bandwidth and other needs raised by e-reading technology.<sup>77</sup>

The needed systemic supports also include professional development for teachers, specialists, librarians, and other school faculty and staff. Because teacher training begins in college teacher preparation programs, these programs must move to incorporate regular

use of e-reading technology. Teacher candidates should use this technology not only as learners, but also as instructors; that is, they should be given opportunities to use it both to learn and to teach. Given the breakneck speed of technological advance, no teacher preparation program will ever be able to keep teachers fully up-to-date in the shifting technological landscape. Schools must thus invest in professional development that helps teachers to use adopted technology to its utmost. As with any effective professional development, these opportunities need to be ongoing and responsive to local problems of practice.

Our fourth recommendation for schools is to capitalize on data. One of the clearest strengths of e-reading technology is in gathering and reporting student data. Teachers require timely data at their fingertips to inform their instruction and intervention decisions. This requirement is made all the more pressing by the current widespread investments by states in Response to Intervention models wherein schools use screening and progress-monitoring assessments to make ongoing decisions about the nature and intensity of supports provided to struggling students. As school systems modernize their data systems, it has become feasible for teachers serving students from pre-kindergarten through postsecondary levels to access the data they need to ensure more seamless transitions between grades and schools—for example, the transition from pre-kindergarten to kindergarten or from middle school to high school. Similarly, monitoring agencies, such as districts and states, will have increasingly timely access to evaluation and other outcome data. And not least, these data streams open up a world of possibilities for research by enabling analysts to take into account students' educational



histories in investigating how and why various practices and interventions work differently for different students.

The increasing wealth of data available through e-reading technology can be perceived either as a burden or as an opportunity to discover how to serve the learning needs of varied populations both locally and for the field more generally. In particular, this wealth of data affords opportunities to investigate how effects of e-reading technology are influenced by key variables that have been largely overlooked, such as teacher experience with technology, consonance of technology tools with the curriculum, and facilitators and barriers to optimal intended use of technology. Policy makers and federal and private funders should provide incentives to school districts and universities to collaborate not only with each other in capitalizing on data, but also with educational publishers and e-reading technology developers, so that information about the design of such innovations can flow in both directions.

## **Conclusion**

Our aim in this article has been to examine how today's changing technological landscape offers both promise and challenges to literacy instruction. The question is not how to fit technology into education but how literacy education can meet society's increasing

demand for technology-savvy citizens who possess higher levels of literacy skills and background knowledge. Our intent has been to highlight issues that educators, researchers, and policy makers must consider in responding to those demands.

The good news is that e-reading technology offers many tools for mitigating both old and new literacy challenges. But e-reading technology tools are just that—tools. To be effective, they must be wielded with care and precision. Not every nail requires a nail gun; sometimes a hammer will do. Similarly, not every literacy problem requires e-reading technology to solve it. Although e-reading technology can be used to deliver rich and meaningful content, it may not support learning unless thoughtful human beings are guiding its use.

We believe that e-reading technology tools can help to improve literacy outcomes for all children and youth. In creating policies and investing in e-reading technology, policy makers, administrators, and educators must ensure the technology's adherence to the Universal Design for Learning concept, attend carefully to the technology's evidence base, provide the infrastructure the technology requires, and take maximum advantage of the increased efficiency and volume of information that technology provides.

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