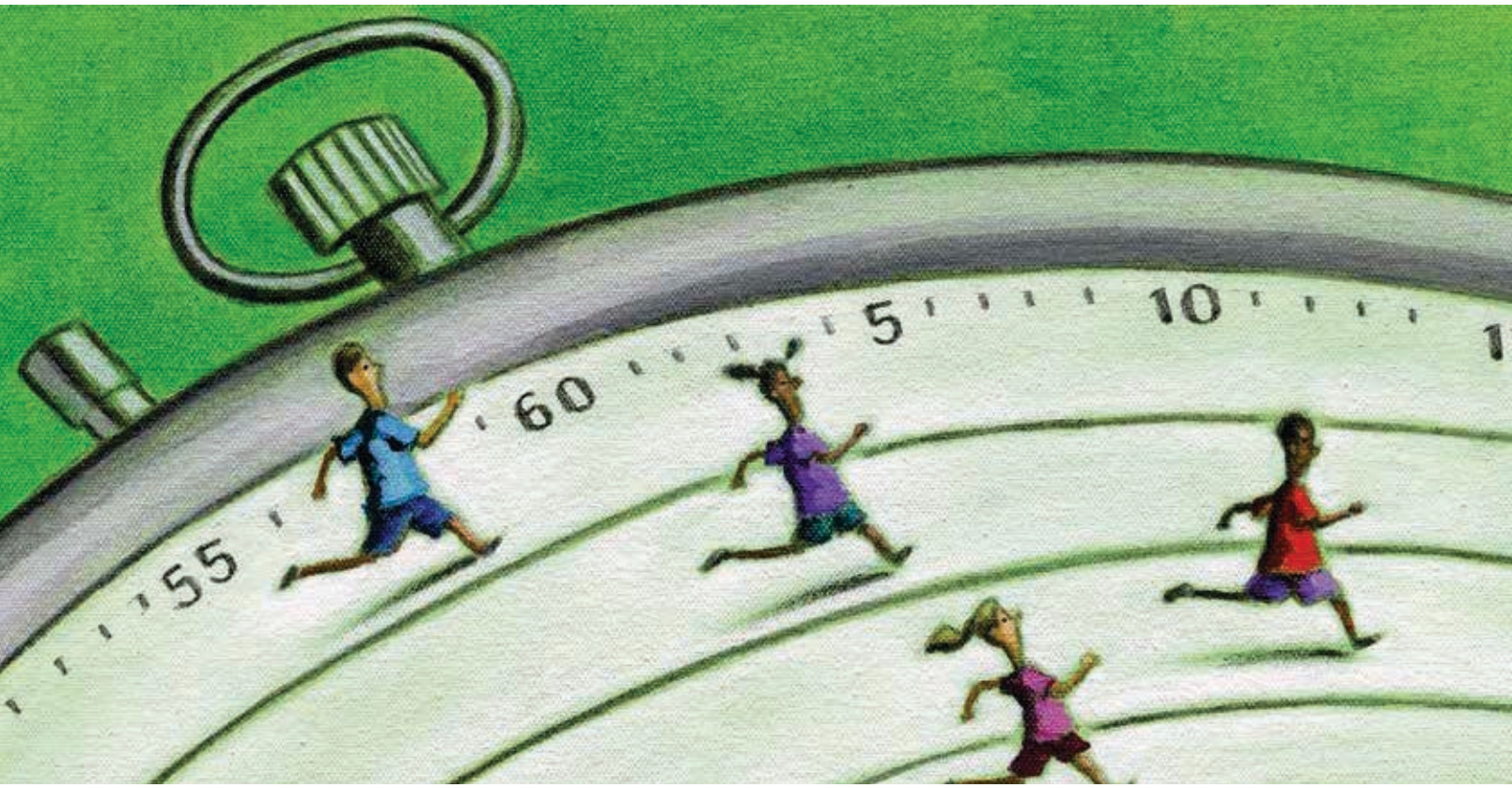
Starting Off Strong

The Importance of Early Learning



By Chrys Dougherty

As our nation strives to have all students graduate from high school ready for college and other postsecondary learning opportunities, we have to confront the reality that we are far from achieving this goal. The problem is most severe with economically disadvantaged students. For example, in states where all 11th-graders take the ACT test, only 45 percent of low-income students in 2012 met the ACT College Readiness Benchmarks in English, 30 percent in reading, 21 percent in mathematics, and 13 percent in science.[1]

For many students, especially those from disadvantaged backgrounds, learning gaps appear in early childhood.[2] Large numbers of disadvantaged students enter kindergarten behind in early reading and mathematics skills, oral language development, vocabulary, and general knowledge. This situation poses a challenge for intervention models that presume that 15 percent or so of students need short-term additional help, 5 percent or so need long-term intervention, and the regular academic program will take care of the rest.[3] In cases where the great majority of students are academically behind and need major assistance, the regular academic program must be upgraded to deliver a richer curriculum to all students. Such a curriculum is highly beneficial for all students, but is especially critical for disadvantaged students, who often arrive from home with limited knowledge and vocabulary. School districts must develop a system of practices that enable such a curriculum to be taught effectively.[4]

Why Early Learning Is Important

That learning gaps emerge early, particularly among disadvantaged students, is one of the better-documented facts in education.[5] Students who do not have a good start usually do not thrive later on. That is not only due to the fact that students in stressful environments with limited learning opportunities often remain in those environments, but also because early learning itself facilitates later learning—students who already know more about a topic often have an easier time learning additional information

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on the same topic, and early exposure to knowledge can stimulate students to want to learn more.[6]

Getting students off to a good start in preschool and the elementary grades is vitally important for several reasons:

Learning takes time. Research studies have addressed the value of allowing sufficient time per topic for students to adequately master the topic.[7] This implies that subject-matter learning should be spread out over many years to permit a range of topics to be addressed in adequate depth. For example, one well-known curriculum for the elementary and middle grades spreads out the study of U.S. history over all of those grades, covering fewer topics in greater depth in each grade.[8]

Learning is cumulative. In a well-designed curriculum, learning in the upper grades builds on prior learning in the lower grades.[9] This is most obvious in the case of mathematics, but is also true for other content areas such as science, history, geography, literature, and the arts. For example, students learning about glucose metabolism in high school biology classes benefit from having learned the necessary prior chemistry knowledge in elementary and middle school.

Student interests often develop at an early age. Students with the good fortune to be exposed to rich content in science, history, and other subjects at a young age may develop an interest in those subjects. Interest, in turn, leads to greater learning.[10] Disadvantaged students often depend on their schools for this exposure, since their access to content outside of school may be limited. Simply having the content available in libraries and on the Internet is not enough, because children need adults to guide them to the content and help them understand it.[11]

Empirical evidence shows the difficulty of catching students up in middle and high school. Several studies have explored the importance of preparation prior to eighth grade for students to have a reasonable chance of meeting college readiness benchmarks by the end of high school.[12] For example, students who were far off track in eighth grade had only a 10 percent chance in reading, 6 percent chance in science, and 3 percent chance in mathematics of reaching ACT's College Readiness Benchmarks by 12th grade. In higher poverty schools, those numbers were 6 percent, 3 percent, and 3 percent, respectively.[13] Results were similar for students catching up between fourth and eighth grade.[14] The harder it is to get off-track students on track in the upper grades, the more important it is to get them on track in the early grades.

Strengthening Early Learning

What kinds of learning are important to emphasize in the early years? The following are components of a strong preschool and elementary school education.

A strong start in reading (decoding) and mathematics. Educators have long emphasized the importance of learning to read well in the early grades, a belief supported by longitudinal research.[15] Reading consists of two abilities: the ability to identify the words on the page (decoding), and the ability to understand the words once they are identified (comprehension). Decoding is the main constraint on reading ability for beginning readers. Fluent decoding depends on mastering letter-sound relationships and becoming familiar with spelling patterns in the English language. Ensuring that students learn to decode well depends, among other things, on using activities and methods in preschool, kindergarten, and first grade that develop children's phonological (sound) awareness and their knowledge of the relationship between letters and sounds.[16] Meanwhile, children's comprehension can be developed in the early grades by reading aloud to them from books that develop their knowledge and vocabulary.

In mathematics, the ability to do simple arithmetic and place numbers on the number line by first grade predicts mathematics performance in fifth grade.[17] Engaging preschool and kindergarten students in games that involve number comparisons, counting, and adding can help prevent mathematics difficulties from emerging in the early elementary grades.[18]

That learning gaps emerge early, particularly among disadvantaged students, is one of the better-documented facts in education.

A content-rich curriculum. A large part of the achievement gap between advantaged and disadvantaged students may be due to greater vocabulary and content learning by students in advantaged home environments.[19] One study found that kindergartners' general knowledge of the world was a better predictor of those students' eighth-grade reading ability than were early reading skills.[20] This is consistent with research showing that reading comprehension, particularly in the upper grades, depends heavily on students' vocabulary and background knowledge.[21] To develop this knowledge, students need a curriculum rich in content not only in English language arts and mathematics, but also in science, history, geography, civics, and the arts.[22]

Development of wide vocabulary and background knowledge takes time.[23] This helps to explain why reading gaps don't close quickly, and why programs that have been successful in closing math skills gaps have had greater difficulty closing reading gaps.[24] The time required to develop students' knowledge and vocabulary is one reason why content-rich curriculum should begin in early childhood. Early content learning can also stimulate curiosity and interest in subjects such as science, history, and art. Content knowledge is also important for abstract reasoning—an abundance of concrete examples make reasoning easier.[25]

By contrast, explicit instruction in comprehension strategies such as "finding the main idea" and "questioning the author" makes only a limited contribution to students' reading comprehension.[26] Therefore, instruction in these strategies should not be

allowed to take large amounts of time away from content-area learning.[27] A content-rich curriculum can also enhance the effectiveness of a major comprehension strategy—"activating the student's prior knowledge"—by increasing the amount of prior knowledge possessed by students.

Activities that develop students' academic and social behaviors. Behaviors such as paying attention, completing assignments, persisting in difficult tasks, and regulating one's own actions (thinking before acting) play a large role in students' success in school and later on in life.[28] Educators can lay the foundation for these behaviors in preschool, kindergarten, and first grade through classroom activities that develop children's "executive function"—their ability to direct their own attention and activity.[29] Programs that target specific desired student behaviors and explicitly teach those behaviors through active learning (students act out or practice the behavior, rather than just being told about it) are effective at improving both behavior and academic achievement.[30]

The time required to develop students' knowledge and vocabulary is one reason why content-rich curriculum should begin in early childhood.

Barriers to Strengthening Early Learning

Three important barriers to strengthening the early curriculum may be summarized under the heading of **A-B-C**: accountability system design, beliefs about early learning, and capacity limitations.

Accountability system design. Accountability systems have been designed to create a sense of urgency about improving test scores. However, this has often had the undesirable effect of shortening educators' time horizons so that they emphasize changes aimed at improving accountability ratings over the short run. These changes can include narrowing the curriculum to de-emphasize subjects not tested in the current grade, and spending inordinate amounts of time coaching students on how to answer sample test questions.[31]

By contrast, many steps to improve academic learning and behaviors take time to bear fruit and may not immediately result in higher test scores. For example, implementing an excellent kindergarten and first-grade reading, mathematics, science, social studies, or fine arts program will not immediately affect test results in the later grades. Neither will field trips to science and art museums, nature areas, and historical sites—all of which develop knowledge of the world. Accountability incentives should be modified to recognize efforts that increase student learning over the longer run and promote learning in grades and subject areas not covered on state tests.

Beliefs about early learning. Some educators and policymakers have resisted the introduction of a content-rich curriculum in the early grades because they do not think that it is the right thing to do. Examples of these beliefs include:

- *The belief that content learning will be boring to young children.* Whether content is meaningful and interesting to students depends largely on how it is taught and on whether students have the prior knowledge needed to appreciate the new information.[32] Good teachers present information in a way that appeals to students' experience and imagination, and good curriculum developers pay attention to building necessary prior knowledge before introducing new information. Thus, the concern that content learning will be boring is largely a concern about the capacity of the school system to provide sound curriculum and effective teaching.
- *The belief that young students should mainly learn content close to their everyday experience.* This belief has held sway mainly in social studies, where a popular curricular approach, "Expanding Environments," focuses on students' families in kindergarten and first grade, neighborhoods in second grade, and community in third grade, before expanding to state history in fourth grade and U.S. history in fifth grade.[33] This approach can sacrifice four years of student learning about the larger world outside their own communities.[34]
- *The belief that students can learn everything they need later by looking up information online.* Understanding and evaluating the cacophony of information and opinion on the Internet—or even knowing what to look up—requires prior knowledge of the subject area being addressed.[35] Further, the ability to look things up does not substitute for prior knowledge when people think or make judgments—learning enough to make informed

decisions usually requires sustained study, not just the acquisition of a few isolated pieces of information.[36] Thus, the ready availability of so much information has probably increased the value of early exposure to knowledge.

- *The belief that teaching academic content in science, social studies, and fine arts in the early grades will crowd out essential learning in reading, mathematics, and academic and social behaviors.* One promising approach to avoid this problem is to integrate learning in the other subject areas into the reading and writing program, using read-alouds to expose beginning readers to content knowledge and vocabulary. The approach treats content learning as an essential part of the comprehension strand of reading instruction.[37] A pilot program using this approach was found to outperform conventional approaches to teaching reading.[38]

Capacity limitations. Teachers in the early grades may not be well equipped with training, instructional materials, and ongoing professional support to teach all of the necessary content in their classrooms. Addressing this problem requires school districts to upgrade their systems that support teaching and learning, as discussed in the next section.

Importance of a System to Support Early Learning

Improving teaching and learning in the early grades requires not a flurry of disconnected initiatives, but a sustained, coherent, coordinated effort by district and school leaders to provide the necessary support for improving practices at the classroom level. Educator practices learned from research on effective schools can be grouped under five major themes, described in more detail in the ACT Core Practice Framework.[39]

Curriculum and academic goals. School districts can support their teachers by developing a clear and specific written curriculum that describes what must be taught in each grade and subject, and provides examples of what mastery of each learning objective looks like. Such a curriculum can address the likely amount of time required to teach each topic and the integration of content across subject areas, issues that are especially important in the early grades.

Staff selection, leadership, and capacity building. Teaching a content-rich curriculum across the subject areas places a large premium on teachers' knowledge and skills, especially for those who teach multiple subjects. This requires the careful selection of school and district leaders who can support teachers as they improve these skills, as well as the provision of frequent common planning times built into the school's master schedule, when teachers can discuss their students' learning in an environment of collaboration and trust. Professional development should be carefully chosen to focus on the most critical knowledge and skills needed to teach the district's curriculum in each subject.

Instructional tools: programs and strategies. School and district leaders should carefully pilot and evaluate instructional materials they are considering for purchase to make sure those materials address the learning goals in the district's written curriculum. A similar process based on evaluation, data, and prior research should be used to make decisions about instructional strategies and arrangements—for example, the extent to which teachers in the early grades should specialize in different subjects.

Monitoring performance and progress. Monitoring student learning is vital for helping educators make instructional decisions: to identify which students need extra help; to place students in learning groups or intervention programs; to know which concepts need to be retaught; and to identify which lessons, teaching strategies, or instructional materials are working. This requires schools and districts to use assessments in the early grades that are based on the district's written curriculum. Frequent formative assessment is needed throughout the year in order for teachers to respond quickly to student needs and keep parents informed about how their children are doing.

Intervention and adjustment. School leaders need to work with teacher teams to identify and assist students who need extra help. Timely assessments make it easier to identify those students early when assistance can have the greatest impact. The same logic applies to identifying and assisting teachers and entire schools in need of support. A school district can be said to have a system to improve early learning when changes in any one of these five areas are accompanied by related changes in the other four areas. For example, changes in the district's written curriculum should be accompanied by matching changes in staff development, instructional resources, assessment, and interventions.[40]

Implementing all of the components of a strong early learning program is difficult and requires a sustained districtwide effort to improve teaching and learning in the early grades. Maintaining such an effort requires school leaders and policymakers to promote public awareness of:

1. **The importance of early learning.** Educators and policymakers must help the public understand the reasons why early learning is so important: that later learning builds on early learning; that learning about a sufficiently broad range of topics takes time, and cannot be accomplished exclusively in the later grades; that catching students up from far behind is difficult in the upper grades; and that early learning develops students' interests and intellectual curiosity, influencing whether they become lifelong learners.

2. **The components of a strong early learning program.** These components include a strong early reading and mathematics program; a content-rich curriculum not only in English language arts and mathematics, but also in science, history, geography, civics, and the arts; and activities designed to develop students' academic and social behaviors.

Teachers need common planning times built into the school's master schedule to discuss student learning in an environment of collaboration and trust.

3. **The obstacles to strengthening early learning programs.** These obstacles include accountability incentives that encourage educators to focus on short-term results on a few measures; beliefs that an increased emphasis on early content learning is not desirable or necessary; and limitations in the training and support for educators in the early grades.

4. **The importance of a system to improve early learning.** School districts should focus on steadily improving practices at the district, school, and classroom levels in five areas: (a) curriculum and academic goals; (b) staff selection, leadership, and capacity building; (c) instructional programs and strategies; (d) monitoring performance and progress; and (e) intervention and adjustment. They can use information derived from the study of effective schools, such as that contained in the ACT Core Practice Framework, as a guide to their improvement effort. ☐

Endnotes

1. Those states were Colorado, Illinois, Kentucky, Michigan, North Dakota, Tennessee, and Wyoming. The data set consisted of the most recent ACT score for each student set to graduate in 2012. For students who retook the ACT their senior year, the scores are from the 2011–2012 school year; otherwise they are from the spring of 2011 when the students were in 11th grade.

2. Betty Hart and Todd R. Risley, *Meaningful Differences in the Everyday Experience of Young American Children* (Baltimore: Paul H. Brookes, 1995).

3. See the description of Response to Intervention models in National Association of State Directors of Special Education (NASDSE) and Council of Administrators of Special Education (CASE), *Response to Intervention: NASDSE and CASE White Paper on RtI* (Washington, DC: National High School Center, 2006).

4. ACT, *The Core Practice Framework: A Guide to Sustained School Improvement* (Iowa City, IA: ACT, 2012); and ACT, *Rising to the Challenge of College and Career Readiness: A Framework for Effective Practices* (Iowa City, IA: ACT, 2012).

5. Hart and Risley, *Meaningful Differences*; Rachel E. Durham, George Farkas, Carol Scheffner Hammer, J. Bruce Tomblin, and Hugh W. Catts, "Kindergarten Oral Language Skill: A Key Variable in the Intergenerational Transmission of Socioeconomic Status," *Research in Social Stratification and Mobility* 25 (2007): 294–305; and Jerry West, Kristin Denton, and Elvira Germino-Hausken, *America's Kindergartners* (Washington, DC: National Center for Education Statistics, 2000).

6. Patricia A. Alexander, Jonna M. Kulikowich, and Sharon K. Schulze, "How Subject-Matter Knowledge Affects Recall and Interest," *American Educational Research Journal* 31 (1994): 313–337; and Daniel T. Willingham, "How Knowledge Helps: It Speeds and Strengthens Reading Comprehension, Learning—and Thinking," *American Educator* 30, no. 1 (Spring 2006): 30–37. The advantages that come from greater initial learning are often referred to as "Matthew effects." Stanovich explains Matthew effects in reading as follows: "The very children who are reading well and who have good vocabularies will read more, learn more word meanings, and hence read even better. Children with inadequate vocabularies—who read slowly and without enjoyment—read less, and as a result have slower development of vocabulary knowledge, which inhibits further growth in reading ability." Keith E. Stanovich, "Matthew Effects in Reading: Some Consequences of Individual Differences in the Acquisition of Literacy," *Reading Research Quarterly* 21 (1986): 360–407, 381.

7. Marc S. Schwartz, Philip M. Sadler, Gerhard Sonnert, and Robert H. Tai, "Depth Versus Breadth: How Content Coverage in High School Science Courses Relates to Later Success in College Science Coursework," *Science Education* 93 (2009): 798–826; and Junlei Li, David Klahr, and Stephanie Siler, "What Lies Beneath the Science Achievement Gap: The Challenges of Aligning Science Instruction with Standards and Tests," *Science Educator* 15, no. 1 (2006): 1–12.

8. Core Knowledge Foundation, "The Core Knowledge Sequence," www.coreknowledge.org/sequence.

9. Willingham, "How Knowledge Helps."

10. Adam V. Maltese and Robert H. Tai, "Eyeballs in the Fridge: Sources of Early Interest in Science," *International Journal of Science Education* 32 (2010): 669–685.

11. Susan B. Neuman and Donna C. Celano, "Worlds Apart: One City, Two Libraries, and Ten Years of Watching Inequality Grow," *American Educator* 36, no. 3 (Fall 2012): 13–23.

12. ACT, *The Forgotten Middle: Ensuring that All Students Are on Target for College and Career Readiness Before High School* (Iowa City, IA: ACT, 2008); ACT, *How Much Growth Toward College Readiness Is Reasonable to Expect in High School?* (Iowa City, IA: ACT, 2010); ACT, *Catching Up to College and Career Readiness* (Iowa City, IA: ACT, 2012); and Chrys Dougherty, *Using the Right Data to Determine if High School Interventions Are Working to Prepare Students for College and Careers* (Washington, DC: National High School Center, 2010).

13. In the study, "far off track" in eighth grade was defined as scoring more than one standard deviation below the ACT College Readiness Benchmark on EXPLORE in the subject in question. ACT, *Catching Up*.

14. ACT, *Catching Up*; and Chrys Dougherty and Steve Fleming, *Getting Students on Track to College and Career Readiness: How Many Catch Up from Far Behind?* (Iowa City, IA: ACT, 2012).

15. Philip E. Kraus, *Yesterday's Children: A Longitudinal Study of Children from Kindergarten into the Adult Years* (New York: John Wiley & Sons, 1973); Dee Norman Lloyd, "Prediction of School Failure from Third-Grade Data," *Educational and Psychological Measurement* 38 (1978): 1193–1200; Connie Juel, *Learning to Read and Write in One Elementary School* (New York: Springer-Verlag, 1994); Anne E. Cunningham and Keith E. Stanovich, "Early Reading Acquisition and Its Relation to Reading Experience and Ability 10 Years Later," *Developmental Psychology* 33 (1997): 934–945; and Donald J. Hernandez, *Double Jeopardy: How Third-Grade Reading Skills and Poverty Influence High School Graduation* (New York: Annie E. Casey Foundation, 2011).

16. Diane McGuinness, *Why Our Children Can't Read, and What We Can Do About It: A Scientific Revolution in Reading* (New York: Free Press, 1997); and National Research Council, *Preventing Reading Difficulties in Young Children* (Washington, DC: National Academies Press, 1998).

17. David C. Geary, "Cognitive Predictors of Achievement Growth in Mathematics: A 5-Year Longitudinal Study," *Developmental Psychology* 47 (2011): 1539–1552.

18. National Research Council, *Mathematics Learning in Early Childhood: Paths Toward Excellence and Equity* (Washington, DC: National Academies Press, 2009). In later grades, students must attain fluency with fractions and subsequently with algebra, which they are more likely to do if they have access to a coherent mathematics curriculum and skilled teaching in the elementary and middle school grades. William H. Schmidt and Curtis C. McKnight, *Inequality for All: The Challenge of Unequal Opportunity in American Schools* (New York: Teachers College Press, 2012); Deborah Loewenberg Ball and Francesca M. Forzani, "Building a Common Core for Learning to Teach and Connecting Professional Learning to Practice," *American Educator* 35, no. 2 (Summer 2011): 17–21, 38; and Liping Ma, *Knowing and Teaching Elementary Mathematics: Teachers' Understanding of Fundamental Mathematics in China and the United States*, 2nd ed. (New York: Routledge, 2010).

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19. Hart and Risley, *Meaningful Differences*; and Paul Tough, *Whatever It Takes: Geoffrey Canada's Quest to Change Harlem and America* (Boston: Houghton Mifflin, 2008), 105–107.

20. David Grissmer, Kevin J. Grimm, Sophie M. Aiyer, William M. Murrah, and Joel S. Steele, "Fine Motor Skills and Early Comprehension of the World: Two New School Readiness Indictors," *Developmental Psychology* 46 (2010): 1008–1017.

21. E. D. Hirsch Jr., "Reading Comprehension Requires Knowledge—of Words and the World," *American Educator* 27, no. 1 (Spring 2003): 10–29, 48; Willingham, "How Knowledge Helps"; and Susan B. Neuman, "Sparks Fade, Knowledge Stays: The National Early Literacy Panel's Report Lacks Staying Power," *American Educator* 34, no. 3 (Fall 2010): 14–17, 39.

22. The Common Core State Standards recognize the reciprocal relationship between reading and content knowledge: "By reading texts in history/social studies, science, and other disciplines, students build a foundation of knowledge in these fields that will also give them the background to be better readers in all content areas. Students can only gain this foundation when the curriculum is intentionally and coherently structured to develop rich content knowledge within and across grades." Common Core State Standards Initiative, *Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects* (Washington, DC: Common Core State Standards Initiative, 2010), 10, www.corestandards.org/assets/CCSSI_ELA%20Standards.pdf.

23. Vocabulary and knowledge acquisition are also closely related to each other. Most vocabulary is learned in context, not memorized from word lists. Knowledge acquisition is essential for helping students understand the context. In addition, many words and phrases (e.g., "democracy") are tied to whole bodies of knowledge, only a small fraction of which is conveyed by their dictionary definitions.

24. For example, studies of New York City charter schools (Hoxby and Murarka) and of KIPP middle schools (Tuttle et al.) found stronger school effects in mathematics than in reading. Caroline M. Hoxby and Sonali Murarka, "New York City Charter Schools: How Well Are They Teaching Their Students?," *Education Next* 8, no. 3 (2008): 54–61; and Christina Clark Tuttle, Bing-ru Teh, Ira Nichols-Barrer, Brian P. Gill, and Philip Gleason, *Student Characteristics and Achievement in 22 KIPP Middle Schools: Final Report* (Washington, DC: Mathematica Policy Research, 2010). Scores on the eighth-grade National Assessment of Educational Progress have risen more in mathematics than in reading. E. D. Hirsch Jr., "Narrowing the Two Achievement Gaps," *Core Knowledge Blog* (blog), November 9, 2007, http://blog.coreknowledge.org/2007/11/09/narrowing-the-two-achievement-gaps; and National Center for Education Statistics, "NAEP Data Explorer," www.nces.ed.gov/nationsreportcard/naepdata.

25. Daniel T. Willingham, *Why Don't Students Like School? A Cognitive Scientist Answers Questions About How the Mind Works and What It Means for the Classroom* (San Francisco: Jossey-Bass, 2009).

26. Daniel T. Willingham, "The Usefulness of *Brief* Instruction in Reading Comprehension Strategies," *American Educator* 30, no. 4 (Winter 2006–2007): 39–45, 50.

27. E. D. Hirsch Jr., *The Knowledge Deficit* (New York: Houghton Mifflin, 2006).

28. ACT, *Impact of Cognitive, Psychosocial, and Career Factors on Educational and Workplace Success* (Iowa City, IA: ACT, 2007); and Richard Sawyer and Neal Gibson, *Exploratory Analyses of the Long-Term Effects of Improving Behavior, Attendance, and Educational Achievement in Grades 1–6 and 8–12*, ACT Research Report Series (Iowa City, IA: ACT, 2012), www.act.org/research/researchers/reports/pdf/ACT_RR2012-3.pdf.

29. Adele Diamond, W. Steven Barnett, Jessica Thomas, and Sarah Munro, "Preschool Program Improves Cognitive Control," *Science* 318, no. 5855 (November 30, 2007): 1387–1388.

30. Joseph A. Durlak, Roger P. Weissberg, Allison B. Dymnicki, Rebecca D. Taylor, and Kriston B. Schellinger, "The Impact of Enhancing Students' Social and Emotional Learning: A Meta-Analysis of School-Based Early Interventions," *Child Development* 82 (2011): 405–432.

31. Linda Perlstein, "School Pushes Reading, Writing, Reform: Sciences Shelved in Effort to Boost Students to 'No Child' Standards," *Washington Post*, May 31, 2004; Linda Perlstein, *Tested: One American School Struggles to Make the Grade* (New York: Henry Holt & Company, 2007); and Common Core, *Learning Less: Public School Teachers Describe a Narrowing Curriculum* (Washington, DC: Common Core, 2012).

32. Daniel T. Willingham, "What Is Developmentally Appropriate Practice?," *American Educator* 32, no. 2 (Summer 2008): 34–39.

33. Diane Ravitch, "Tot Sociology: Or What Happened to History in the Grade Schools," *American Scholar* 56, no. 3 (Summer 1987): 343–354; Diane Ravitch, *Left Back: A Century of Failed School Reforms* (New York: Simon & Schuster, 2000); and Brian Frazee and Samuel Ayres, "Garbage In, Garbage Out: Expanding Environments, Constructivism, and Content Knowledge in Social Studies," in *Where Did Social Studies Go Wrong?,* ed. James Leming, Lucien Ellington, and Kathleen Porter-Magee (Washington, DC: Thomas B. Fordham Institute, 2003), 111–123.

34. If science content were similarly restricted, then the study of dinosaurs, ocean life, volcanoes, and other things not in the students' immediate environment would be removed from the curriculum in kindergarten through third grade.

35. E. D. Hirsch Jr., "'You Can Always Look It Up' … or Can You?," *American Educator* 24, no. 1 (Spring 2000): 4–9; and Robert Pondiscio, "21st Century Skills and the Tree Octopus Problem," *Core Knowledge Blog* (blog), February 5, 2009, http://blog.coreknowledge.org/2009/02/05/21st-century-skills-and-the-tree-octopus-problem.

36. For example, most readers are unqualified to practice medicine despite the vast array of medical knowledge available on the Internet and in readily accessible reference books.

37. Daniel T. Willingham, "Teaching Content Is Teaching Reading," YouTube video, 9:58, posted by "Daniel Willingham," January 9, 2009, www.youtube.com/watch?v=RiP-ijdxqEc.

38. Jennifer Dubin, "More Than Words: An Early Grades Reading Program Builds Skills and Knowledge," *American Educator* 36, no. 3 (Fall 2012): 34–40; and Research and Policy Support Group, *Evaluating the NYC Core Knowledge Early Literacy Pilot: Years 1–3 Overview* (New York: New York City Department of Education, n.d.).

39. ACT, *Core Practice Framework*; and ACT, *Rising to the Challenge*. To learn more about the ACT Core Practice Framework, which identifies the successful practices of high-performing schools, see www.act.org/products/additional-products-assessments/act-core-practice-framework.

40. ACT, *Core Practice Framework*; and ACT, *Rising to the Challenge*.

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