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Catching Up to College and Career Readiness: The Challenge Is Greater for At-Risk Students

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Introduction

Educators and policymakers have set a goal that all students graduate from high school ready for college and careers. As a nation, however, we are falling short of achieving this goal, particularly for students from at-risk groups. In 2013, in states with the highest percentages of students taking the ACT® college readiness assessment, 41% of students from the two lowest family income categories met ACT College Readiness Benchmarks[1] in English, 19% in mathematics, 23% in reading, and 17% in science.[2]

A substantial body of research supports the idea that the path to college and career readiness begins well before middle and high school. Gaps in vocabulary development begin in very early childhood.[3] Large numbers of disadvantaged students enter kindergarten behind in early reading and mathematics skills, oral language development, vocabulary, and general knowledge.[4] In turn, early reading and mathematics skills and general knowledge predict student success in the later grades.[5] Learning gaps are likely to widen over time because of "Matthew effects," whereby those who start out ahead are at a relative advantage in acquiring new knowledge.[6]

As a result of these effects, many middle and high schools inherit large numbers of students who are academically far off track—well below the level that predicts they are likely to graduate college and career ready. This is especially true for schools serving at-risk student populations. Substantial resources and energy have been invested into increasing the capacity of high schools to address the needs of those students.[7] But if it's difficult for middle and high schools to close these students' academic preparation gaps despite the extra attention, perhaps more should be invested in narrowing the gaps earlier.

In an earlier policy report,[8] ACT examined the percentage of academically far off track students in grade 8 from multiple states who were able to reach ACT College Readiness Benchmarks on the ACT in grade 12, as an indicator of the challenges school systems face in closing academic preparation gaps at the high school level. We also looked at the percentage of far off track students in grade 4 in a single state, Arkansas, who reached the corresponding Benchmarks on ACT Explore® in eighth grade. This served to indicate the difficulty of closing students' preparation gaps in the middle grades. In all cases, we found that relatively few far off track students caught up in four years—typically fewer than 10%. We also noted that our high school student sample in particular was subject to selection bias in favor of more motivated students who stayed in school and took three college readiness tests. Therefore, we concluded, a more representative sample would probably show even lower catching-up rates for high school students who were behind academically.

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This report extends our earlier research by analyzing student catch-up rates in grades 4–8 (middle grades) and 8–11 or 8–12 (high school) by student demographic subgroup.[9] Two states, Arkansas and Kentucky, supplied the data needed to link student enrollment and test records across those grade spans and to disaggregate students into the following demographic groups:

- All students
- Low-income students[10]
- Non–low-income students
- African American students
- Hispanic students
- Other students (not African American or Hispanic)[11]
- English language learners[12]
- Special education students

Disaggregating the data by demographic group is important because at-risk demographic groups are likely not only to have higher percentages of students who are academically far off track, but also have lower percentages of far off track students who catch up.

Catching Up in High School

How many students from different demographic groups were Far Off Track in eighth grade?

Our analysis covered multiple cohorts of Arkansas and Kentucky students who took ACT Explore as eighth graders and the ACT in grade 11 or 12.[13] For purposes of this study, we divided eighth-grade students from each demographic group into three *academic preparation groups* in each subject based on their performance on ACT Explore in that subject:

- ***On Track*** students met the ACT College Readiness Benchmark on ACT Explore (Table 1) in the subject.
- ***Off Track*** students missed the Benchmark by one standard deviation or less.

Table 1. ACT College Readiness Benchmarks[15]

Subject Area Test	ACT Explore Benchmark Grade 8	ACT Plan® Benchmark	ACT Benchmark
English	13	15	18
Reading	16	18	22
Mathematics	17	19	22
Science	18	20	23

Table 2. Percentages of Students Who Were Far Off Track on Grade 8 ACT Explore

Category	Mathematics	Reading	Science
All students	32	39	31
Low-income*	43	51	40
Non–low-income	21	28	21
African American	51	61	48
Hispanic	40	50	38
Other*	28	35	28
English language learners	57	70	52
Special education	72	70	63

* Low-income students were defined as those eligible for the free and reduced price lunch program. "Other" students were those who are not African American or Hispanic. In Arkansas and Kentucky, the greater majority of Other students were White.

At-risk student groups are highlighted.

- ***Far Off Track*** students scored more than a full standard deviation below the Benchmark. These are the students treated as "academically far behind" in this report.

For example, a score of 16 or better on the ACT Explore Reading assessment indicated that a student was On Track; Off Track students scored from 13 to 15, while students scoring 12 or below were classified as Far Off Track.[14]

As shown in Table 2, substantial percentages of eighth graders from all demographic groups were Far Off Track in mathematics, reading, and science in 2006–07, 2007–08, and 2008–09, the starting years for the longitudinal grades 8–11 and 8–12 cohorts in the study.[16] [17] Students in at-risk demographic groups (highlighted in Table 2) were Far Off Track at higher rates than their less-at-risk counterparts. Using reading as an example, 28% of non–low-income but 51% of low-income eighth graders were Far Off Track. Compared with the low-income student group, similar percentages of Hispanic students were Far Off Track in each subject, while the percentages for African American, English language learners, and special education students were higher. These percentages underscore the challenges faced by many high schools in educating students from at-risk groups.[18]

What percentage of eighth graders from the three academic preparation groups (On Track, Off Track, and Far Off Track) met ACT College Readiness Benchmarks in grade 11 or 12?

As Figure 1 illustrates, it was difficult for students starting Off Track or Far Off Track to catch up in high school. For example, in mathematics, only 2% of Far Off Track eighth graders in longitudinal cohorts in the study reached the ACT College Readiness Benchmarks in grade 11 or 12 (Figure 1). The corresponding percentages were 14% for Off Track students and 64% for On Track students. The results were similar in reading and science.

As Figures 2 and 3 illustrate, catching up (for Off Track and Far Off Track students) or staying on track (for On Track students) was more difficult for low-income than for non–low-income students. Using reading as an example, 4% of low-income Far Off Track eighth graders met the ACT Benchmarks in grades 11 or 12 (Figure 2), compared with 8% for their non–low-income counterparts (Figure 3). In general, low-income students in each of the three academic preparation groups reached the ACT Benchmarks at lower rates than their non–low-income counterparts in every subject.

These longitudinal cohorts included only students who stayed in school and followed a normal grade progression. The inclusion of dropouts and students who were held back a grade would likely reduce the percentages of students reaching ACT Benchmarks and widen the observed disparity between low-income and non–low-income students.[19]

Figure 1. Percentage Meeting ACT College Readiness Benchmarks (Grades 11 and 12 ACT)
All Students Disaggregated by Grade 8 Academic Preparation Level

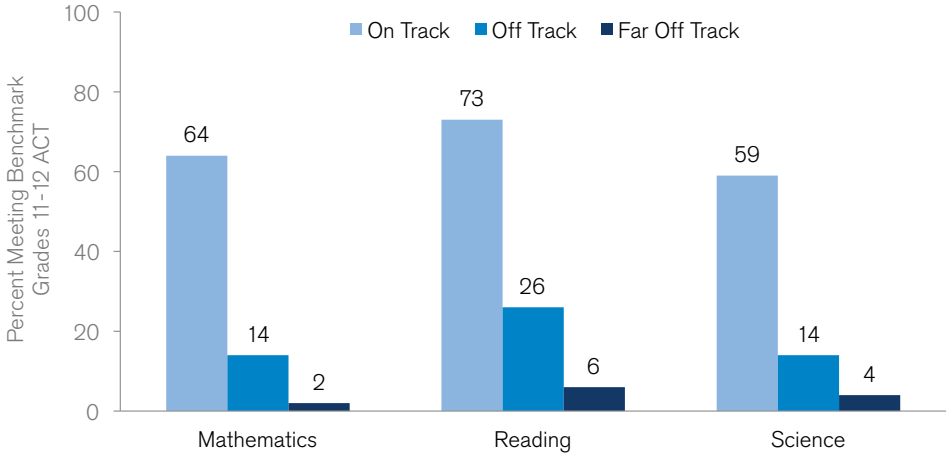


Figure 2. Percentage Meeting College Readiness Benchmarks (Grades 11 and 12 ACT)
Low-Income Students Disaggregated by Grade 8 Academic Preparation Level

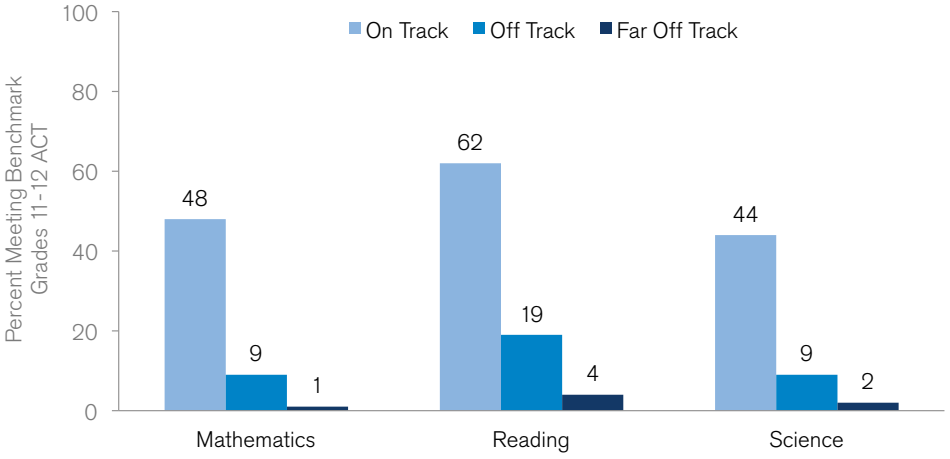
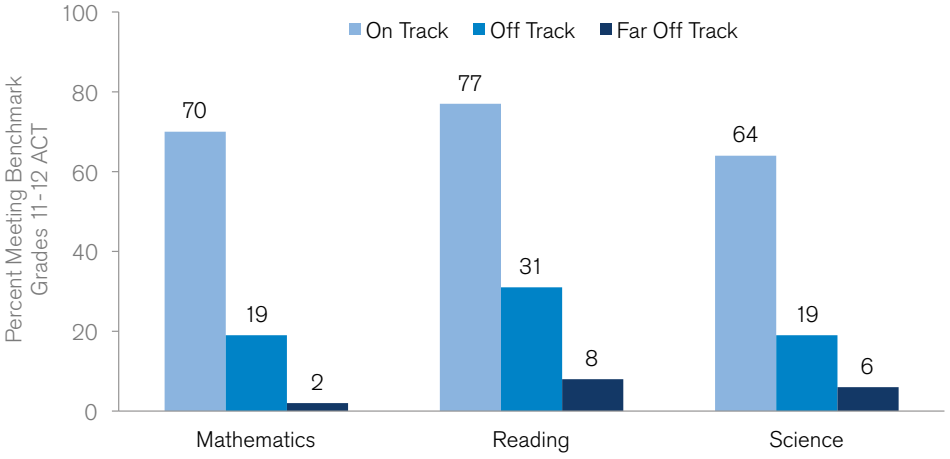


Figure 3. Percentage Meeting College Readiness Benchmarks (Grades 11 and 12 ACT)
Non–Low-Income Students Disaggregated by Grade 8 Academic Preparation Level



What percentage of Far Off Track eighth graders from different student demographic groups caught up or nearly caught up by grade 11 or 12?

In addition to calculating the percentage of Far Off Track eighth graders who reached the ACT Benchmarks, we also examined the percentage of Far Off Track students who nearly reached the Benchmarks. In this analysis, we defined "nearly reached the ACT Benchmark" as scoring a half standard deviation or less below the Benchmark—in the top half of the Off Track achievement level.

Figure 4 shows the percentage of Far Off Track eighth-grade students in each subject who either reached or nearly reached the ACT Benchmark, disaggregated by student family income. Using reading as an example, 4% of low-income students (bottom bar segment) who were Far Off Track in eighth grade reached the ACT Benchmark in grade 11 or 12—the same information shown in Figure 2. Adding in students who nearly reached the ACT Benchmark (top bar segment) brings the total to 15%. Conversely, 85% of low-income eighth graders who were Far Off Track in reading did not come close to reaching the ACT Benchmark by grade 11 or 12. For non–low-income students, 24% reached or nearly reached the reading Benchmark, leaving 76% who did not. This was the highest percentage of Far Off Track students from any demographic group who reached or nearly reached the ACT Benchmark in any subject. In all cases, low-income Far Off Track students reached or nearly reached Benchmarks at lower rates than their non–low-income counterparts.

Figure 4. Percentage of Far Off Track Eighth-Grade Students Reaching or Nearly Reaching ACT Benchmarks in Grade 11 or 12, By **Student Income**

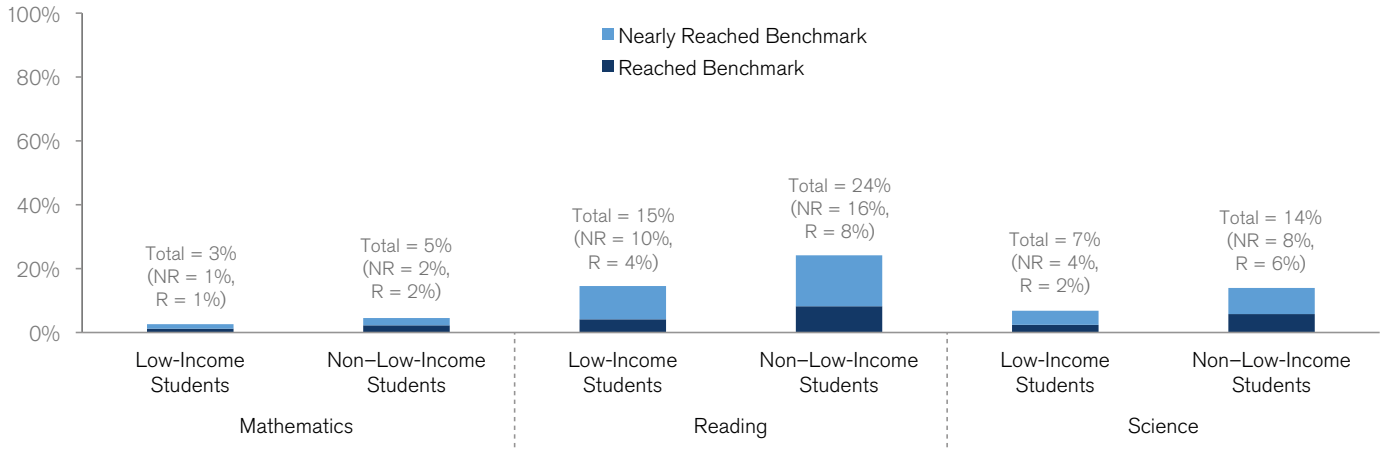
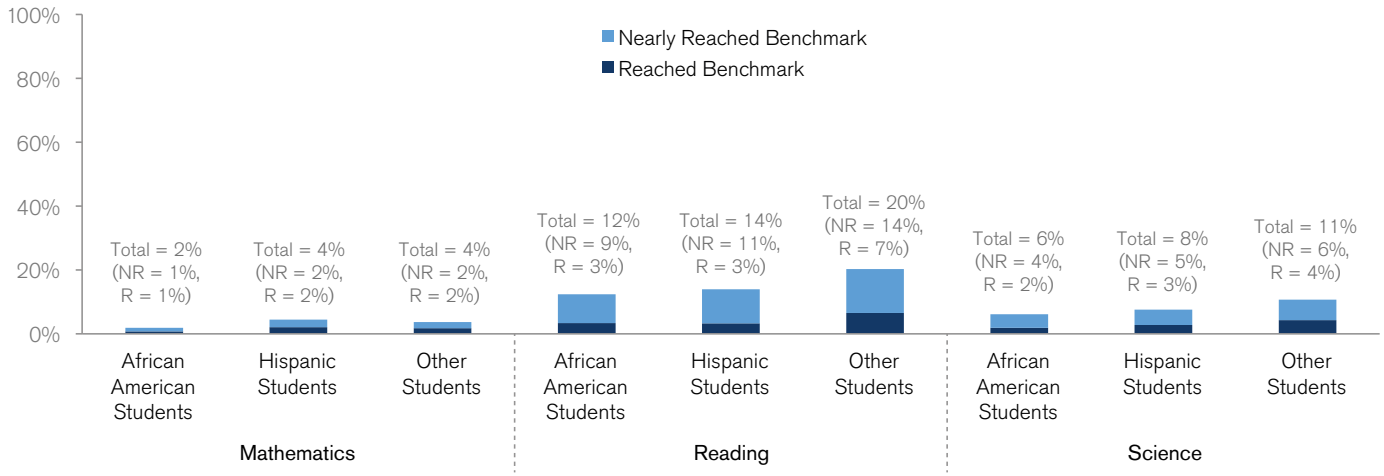
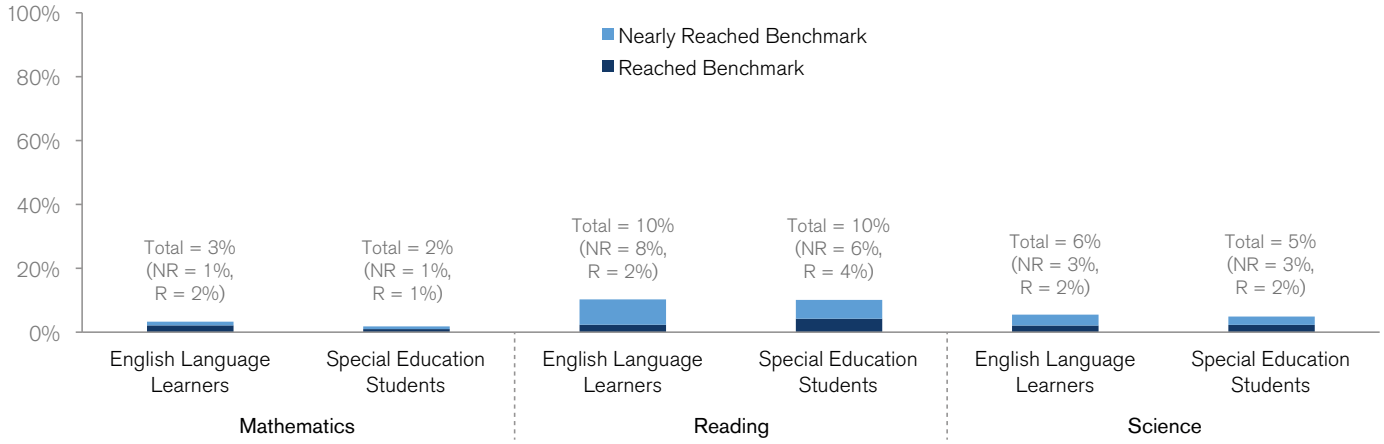


Figure 5. Percentage of Far Off Track Eighth-Grade Students Reaching or Nearly Reaching ACT Benchmarks in Grade 11 or 12, By **Student Ethnicity**



Note: Subtotals may not add to totals due to rounding.

Figure 6. Percentage of Far Off Track Eighth-Grade Students Reaching or Nearly Reaching ACT Benchmarks in Grade 11 or 12, for **English Language Learners and Special Education Students**



Figures 5 and 6 provide similar information by student ethnic category and for English language learners and special education students. In nearly all cases, Far Off Track students from at-risk groups reached or nearly reached the Benchmarks at lower rates than did their less-at-risk counterparts—the sole exception was for Hispanic versus Other students in mathematics. The picture was slightly more favorable in reading than in mathematics and science. Taking African American students as an example, 12% of Far Off Track students reached or nearly reached the Benchmark in reading by grade 11 or 12, compared with 2% in mathematics and 6% in science. This leaves 88% of Far Off Track African American students who did not come close in reading, 98% in mathematics, and 94% in science. Low catch-up rates by students from at-risk groups are of special concern since students from those groups are more likely to be Far Off Track in the first place (Table 2).

Catching Up in Grades 4–8

How many students from different demographic groups were Far Off Track in fourth grade?

To classify fourth-grade students into the three academic preparation groups (On Track, Off Track, and Far Off Track) in each subject, we used longitudinal student data from the two states in the study to match fourth-grade state test and eighth-grade ACT Explore scores for the same students. We identified the lowest fourth-grade score in each subject in each state associated with a 50% or better chance of reaching the ACT Explore benchmark in the same subject; fourth-grade students scoring at or above this target score were categorized as On Track in the subject.[20] Using a similar definition as in eighth grade, Off Track fourth-grade students scored no more than one standard deviation below the target score, and Far Off Track students missed the target by more than one standard deviation.[21]

As shown in Table 3, substantial percentages of fourth graders from all demographic groups were Far Off Track in mathematics, reading, and science in 2006–07 and 2007–08, the starting years for the longitudinal grades 4–8 cohorts in the study.[22] Students in at-risk demographic groups (highlighted in Table 3) were Far Off Track at higher rates than their less-at-risk counterparts. Using reading as an example, 29% of non–low-income but 53% of

Table 3. Percentages of Students Who Were Far Off Track in Grade 4

Category	Mathematics	Reading	Science
All students	38%	43%	44%
Low-income*	49%	53%	55%
Non–low-income	25%	29%	32%
African American	59%	64%	69%
Hispanic	47%	56%	58%
Other*	33%	38%	40%
English language learners	54%	65%	69%
Special education	62%	67%	61%

* Low-income students were defined as those eligible for the free and reduced price lunch program. "Other" students were those who are not African American or Hispanic. In Arkansas and Kentucky, the greater majority of those students were White.

At-risk student groups are highlighted. Science results were from Kentucky, as Arkansas did not test science in fourth grade. Fourth-grade reading results for Arkansas were those on the Literacy test, which also covers writing.

low-income fourth graders were Far Off Track. Similar disparities existed between those two groups in mathematics and science. As was the case in eighth grade, Far Off Track rates for Hispanic students were similar to those in the low-income group, while African American students, English language learners, and special education students were Far Off Track at higher rates. As is the case for high school, these percentages underscore the challenges faced by many elementary and middle schools in educating students from at-risk groups.

What percentage of fourth graders from the three academic preparation groups (On Track, Off Track, and Far Off Track) met the ACT Explore Benchmarks in grade 8?

Figure 7 shows how the percentage of students meeting the ACT Explore Benchmarks in grade 8 was related to students' academic preparation level in fourth grade. In mathematics, for example, 6% of Far Off Track and 31% of Off Track students caught up in grades 4–8, while 69% of previously On Track students stayed on track. The pattern was similar for reading and science.

As Figures 8 and 9 indicate, catching up (for Off Track and Far Off Track students) or staying on track (for On Track students) in the middle grades was more difficult for low-income than for non–low-income students. Using reading as an example, 6% of Far Off Track low-income fourth graders met the ACT Explore Benchmark in grade 8 (Figure 8), versus 10% for their non–low-income counterparts (Figure 9). For the Off Track group, 27% of low-income and 40% of non–low-income students reached the Benchmark, while the corresponding percentages for fourth-grade On Track students were 53% for low-income and 71% for non–low-income students.

Figure 7. Percentage Meeting ACT College Readiness Benchmarks (Grade 8 ACT Explore) **All Students** Disaggregated by Grade 4 Academic Preparation Level

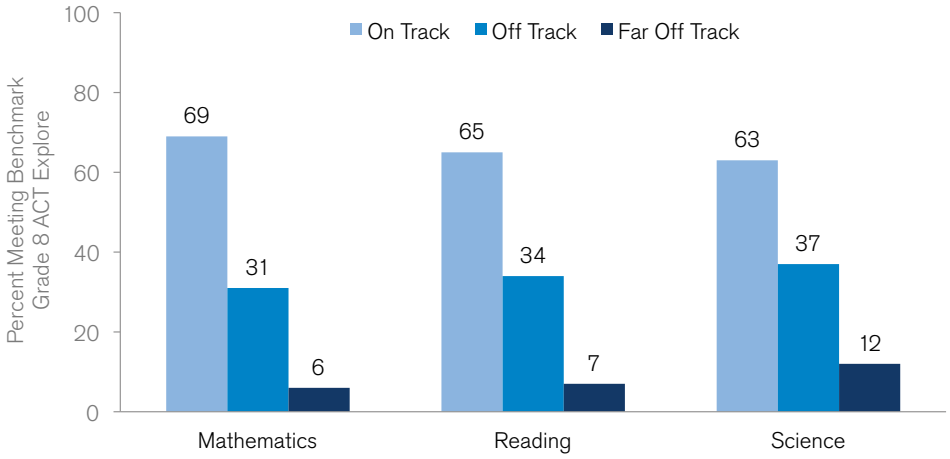


Figure 8. Percentage Meeting College Readiness Benchmarks (Grade 8 ACT Explore) **Low-Income Students** Disaggregated by Grade 4 Academic Preparation Level

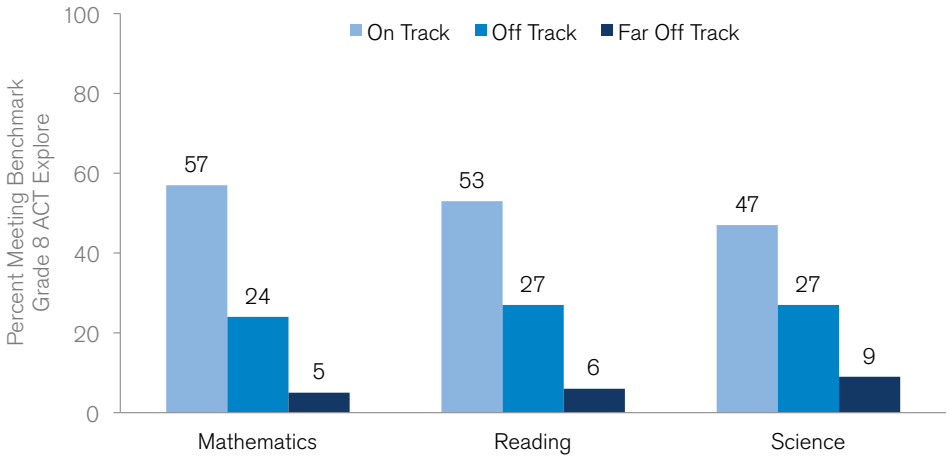
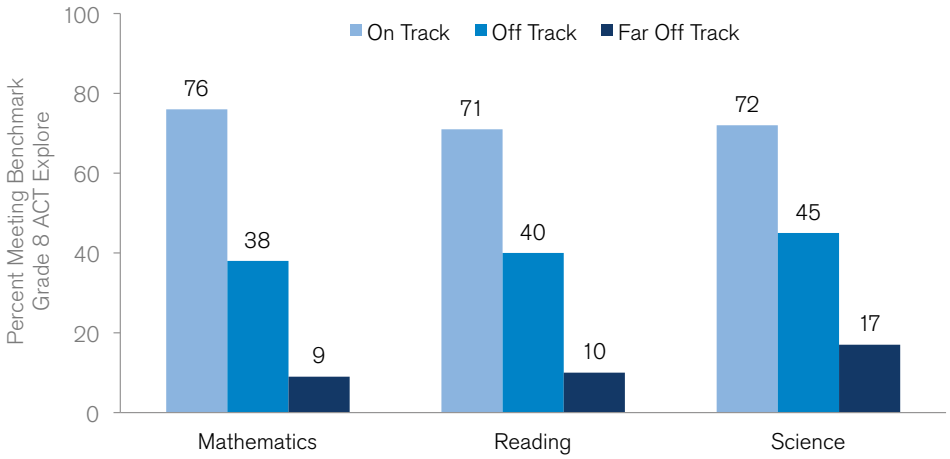


Figure 9. Percentage Meeting ACT College Readiness Benchmarks (Grade 8 ACT Explore) **Non–Low-Income Students** Disaggregated by Grade 4 Academic Preparation Level



What percentage of Far Off Track fourth graders from different student demographic groups caught up or nearly caught up by eighth grade?

Figure 10 shows the percentage of Far Off Track fourth-grade students in each subject who reached or nearly reached the ACT Explore Benchmark, disaggregated by student family income. As was the case in high school, we defined "nearly reached the ACT Explore Benchmark" as scoring a half standard deviation or less below the Benchmark—in the top half of the Off Track achievement level in grade 8.

Using mathematics as an example, 5% of low-income students (bottom bar segment) who were Far Off Track in fourth grade reached the ACT Explore Benchmark in grade 8—the same information shown in Figure 8. Adding students who nearly reached the Benchmark (top bar segment) brings the total to 13%. Conversely, 87% of Far Off Track low-income fourth graders did not come close to reaching the ACT Explore Benchmark. For non–low-income students, 22% reached or nearly reached the Benchmark, leaving 78% who did not.

The highest percentage for any subject and demographic group was for non–low-income students in science, where 36% of Far Off Track students met or nearly met the Benchmark, leaving 64% who did not.

Figures 11 and 12 provide similar information by student ethnic category and for English language learners and special education students. The picture was slightly more favorable in science than in mathematics and reading. Taking African American students as an example, 16% of Far Off Track fourth-grade students reached or nearly reached

Figure 10. Percentage of Far Off Track Fourth-Grade Students Reaching or Nearly Reaching Grade 8 ACT Explore Benchmarks, By **Student Income**

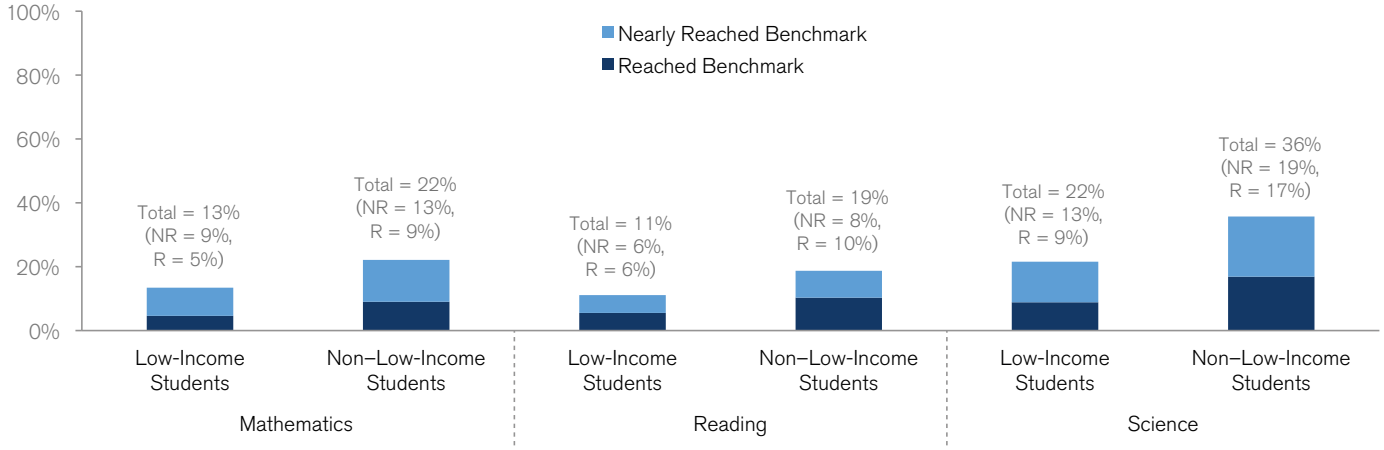
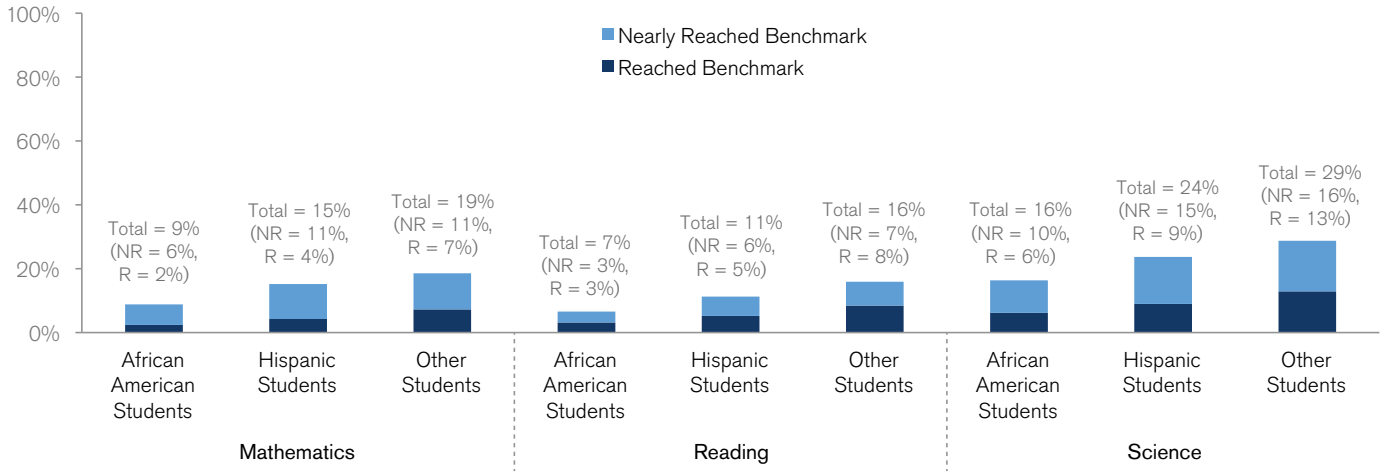
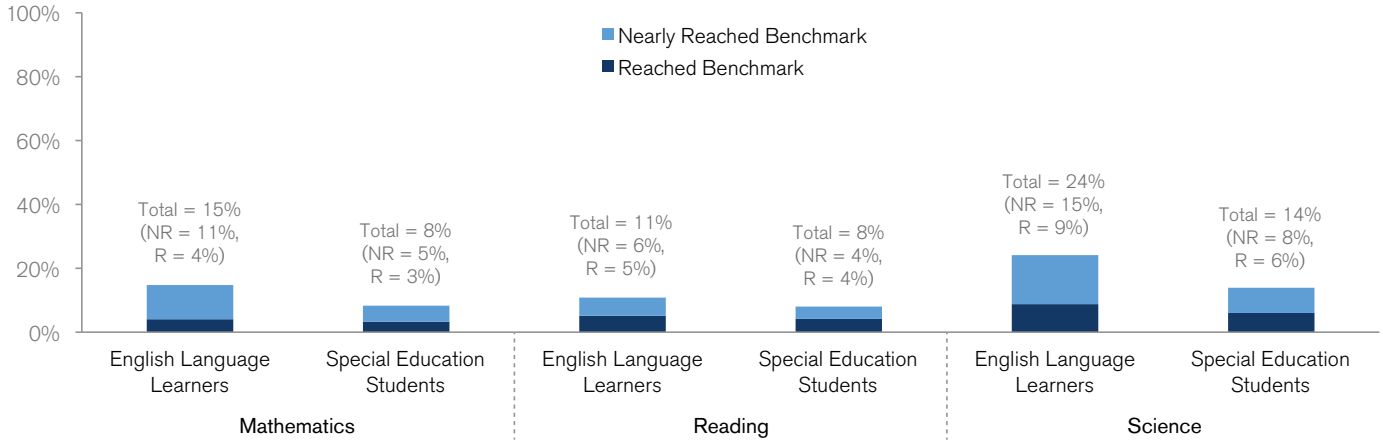


Figure 11. Percentage of Far Off Track Fourth-Grade Students Reaching or Nearly Reaching Grade 8 ACT Explore Benchmarks, By **Student Ethnicity**



Note: Subtotals may not add to totals due to rounding.

Figure 12. Percentage of Far Off Track Fourth-Grade Students Reaching or Nearly Reaching Grade 8 ACT Explore Benchmarks, for **English Language Learners and Special Education Students**



the science Benchmark in eighth grade, compared with 9% in mathematics and 7% in reading. This still left 84% who did not come close to the science Benchmark.

In general, Far Off Track students from at-risk groups reached or nearly reached Benchmarks at lower rates in the same subject than their less-at-risk counterparts, a matter of concern given that students from at-risk groups were more likely to be Far Off Track in fourth grade (Table 3).

How did growth by Far Off Track students in the middle grades compare with growth by Far Off Track students in high school?

A comparison of grades 8 to high school (Figures 1–6) with grades 4–8 (Figures 7–12) provides evidence that students caught up at higher rates in the middle grades than in high school, especially in mathematics and science. However, growth comparisons between grades 4–8 and 8–11 or 12 can be difficult to interpret for various reasons. One is differences in selection effects between the two levels. These effects ought to favor growth by students in high school cohorts, as attrition of less-prepared and more poorly motivated students is likely to be greater in high school than in the middle grades. To the extent that we nonetheless observe more students catching up in the middle grades, this could strengthen the argument that catching students up is easier in those grades.

A second issue is differences in the content alignment of the fourth-grade state test with the eighth-grade ACT Explore, compared with the alignment of ACT Explore with the ACT. A more closely aligned prior test is better able to identify which students are Far Off Track with regard to the content measured on the later test, producing lower catching-up rates for the better-identified Far Off Track students. To the extent that ACT Explore is better aligned with the ACT than a fourth-grade state test is with ACT Explore, this effect would work in the opposite direction from selection effects, making catching up appear to be easier in the middle grades.[23]

Regardless of whether catching up students turns out to be easier in earlier grades, starting earlier gives students more time to do so.

Conclusion

The results of this study extend the findings of our previous research to show the additional difficulty of catching up Far Off Track students from at-risk demographic groups. Our recommendations in this section should be of great interest to educators and policymakers concerned about meeting the needs of at-risk students. Each recommendation should be implemented not in isolation, but accompanied by all of the supporting changes needed to make it work.

At the local level, **school and district leaders** should consider the following strategies:

- *Teach a content-rich curriculum in the early grades.* Ensure that all students receive a content- and vocabulary-rich curriculum beginning in the early years, spanning a range of subject areas including not only English language arts and mathematics, but also science, history, geography, civics, foreign language, and the arts.[24] [25] Such a curriculum—the basis for preparing students long term for college, careers, and informed citizenship—is valuable for all students but is likely to be especially beneficial for

students from at-risk demographic groups, who are more likely to arrive from home with limited knowledge and vocabulary.[26] Thus, teaching a rich curriculum to all students is likely to help counteract Matthew effects and narrow achievement gaps. In addition, educators can work to strengthen the reading and mathematics program in preschool through third grade and implement programs and strategies that improve students' attendance and academic behaviors.[27] [28] [29]

- *Conduct a "gap analysis" of the district's current practices.* To perform such an analysis, educators can use the ACT Core Practice™ Framework, which provides a detailed list of district-, school-, and classroom-level practices organized into five areas:[30]
  - Curriculum and Academic Goals—What do we expect all students to know and be able to do in each course, grade, and subject?
  - Staff Selection, Leadership, and Capacity Building—How do we select and develop the leaders and teachers needed to ensure every student in the system meets these expectations?
  - Instructional Tools: Programs and Strategies—What programs, strategies, materials, and time allocation do we use to teach the necessary content and skills?
  - Monitoring Performance and Progress—How do we know if students learned what they should?
  - Intervention and Adjustment—If students are not learning what they should, what do we do about it?

  Teams of educators at the school and district levels can use the framework's self-evaluation rubrics to compare local practices with those described in the framework and identify where they should focus their improvement efforts.
- *Monitor and intervene early.* Use multiple indicators to monitor whether students are on track, beginning in the early grades. Monitor student engagement as well as student learning. The early emergence of preparation gaps and their tendency to widen over time underscore the importance of monitoring student progress in the early years. Monitoring should guide decisions about how to improve the regular academic program as well as the choice of interventions. Combining data on student academic progress with information on the interventions students receive can provide evidence on which interventions are most effective for students.[31]
- *Use data on students' prior achievement in planning and evaluating secondary school programs.* Educators and researchers should use data to identify what levels of prior achievement put students in a strong position to succeed in specific middle and high school programs, such as Advanced Placement or early-college high schools. When monitoring the impact of programs implemented in the later grades, ask *for which students* (based on prior academic preparation) is this program producing good results? For example, a high school program might turn out to be suitable for On Track students but inadequate for Far Off Track students. Changes might need to be made in earlier grades to enable more students to benefit from advanced academic programs in the middle and upper grades.[32]

State and local policymakers, for their part, should consider the following:

- *Focus on the long term in school accountability.* Redesign accountability systems to encourage actions taken to produce long-term gains in student learning. Educators and policymakers should look not only at short-term test score trends but at whether the school system is putting in place practices that are likely, based on sound research, to bear fruit over the long term. For example, adopting a content-rich curriculum that builds knowledge and vocabulary in the early grades is likely to pay off with better reading comprehension in the upper grades.[33]
- *Use data to inform the setting of accountability goals.* Use data on historically observed student growth to identify realistic goals that schools might be expected to accomplish. For example, reasonable growth goals might be set based on student performance in more successful schools,[34] and goals for percentages of students reaching college and career readiness should take into account students' starting points and the number of years the school has available to catch them up.

Federal policymakers should consider the following:

- *Encourage the use of statewide longitudinal data systems for research studies.* Continue to fund the development of statewide longitudinal data systems that make possible research on long-term student progress such as that featured in this report. Encourage states to facilitate access to the data by third-party researchers under appropriate privacy protections.[35]
- *Fund evaluation research on teaching a content-rich curriculum in the early grades.* Fund research through the Institute for Education Sciences to evaluate programs and strategies aimed at reducing achievement gaps by promoting a content-rich curriculum. ■

Endnotes

1 The ACT College Readiness Benchmarks on the ACT represent scores in each subject—English, mathematics, reading, and science—that indicate that a student has a 50% or better chance of earning a B and a 75% or better chance of earning a C in corresponding entry-level college courses. For example, student scores on the ACT Mathematics test were matched to the same students' grades in College Algebra, and ACT Science scores were matched to college grades in Biology. On the ACT Explore and ACT Plan tests, the Benchmarks represent scores associated with at least a 50% probability that the student will later score at or above the ACT College Readiness Benchmark on the ACT. See ACT, "What Are the ACT College Readiness Benchmarks?" (Iowa City, IA: ACT, 2013), http://www.act.org/research/policymakers/pdf/benchmarks.pdf.

2 The states with the highest percentages of students taking the ACT were Colorado, Illinois, Kentucky, Michigan, North Carolina, North Dakota, Tennessee, and Wyoming. These states generally have all eleventh graders take the ACT; many students retake the test in grade 12. The data file contained the most recent ACT scores of students who were twelfth graders in 2013; ACT scores for students who did not take the ACT in twelfth grade came from earlier grades and years. The two family income categories in combination consisted of students with a self-reported family income of less than $36,000 a year.

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

4 George Farkas and Kurt Beron, "The Detailed Age Trajectory of Oral Vocabulary Knowledge: Differences by Class and Race," *Social Science Research* 33 (2004): 464-497; Rachel E. Durham, George Farkas, Carol Scheffner Hammer, J. Bruce Tomblin, and Hugh W. Catts, "Kindergarten Oral Language Skills: A Key Variable in the Intergenerational Transmission of Socioeconomic Status," *Research in Social Stratification and Mobility* 25 (2007): 294-305; Jerry West, Kristin Denton, and Elvira Germino-Hausken, *America's Kindergartners* (Washington, D.C.: National Center for Education Statistics, 2000, http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2000070.

5 Greg J. Duncan, Amy Claessens, Aletha C. Huston, Linda S. Pagani, Mimi Engel, Holly Sexton, Chentelle J. Dowsett, Katherine Magnuson, Pamela Klebanov, Leon Feinstein, Jeanne Brooks-Gunn, Kathryn Duckworth, and Crista Japel, "School Readiness and Later Achievement," *Developmental Psychology* 43, no. 6 (2007): 1428-1446; Amy Claessens and Mimi Engel, "How Important Is Where You Start? Early Mathematics Knowledge and Later School Success," *Teachers College Record* 115 (2013): 1-29; David Grissmer, Kevin Grimm, Sophie M. Aiyer, William M. Murrah, and Joel S. Steele, "Fine Motor Skills and Early Comprehension of the World: Two New School Readiness Indicators," *Developmental Psychology* 46, no. 5 (2010): 1008-1017; David C. Geary, "Cognitive Predictors of Achievement Growth in Mathematics: A 5-Year Longitudinal Study," *Developmental Psychology* 47, no. 6 (2011): 1539-1552, http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3210883/.

6 For a discussion of Matthew effects in the context of early reading, see Keith Stanovich, "Matthew Effects in Reading: Some Consequences of Individual Differences in the Acquisition of Literacy," *Reading Research Quarterly* 31, no. 4 (1986), 360-407, http://www.psychologytoday.com/files/u81/Stanovich__1986_.pdf.

7 For discussions of ways to better address the needs of high school students, see http://www.betterhighschools.org.

8 ACT, *Catching Up to College and Career Readiness* (Iowa City, IA: ACT, 2012), http://www.act.org/research/policymakers/reports/catchingup.html. See also Chrys Dougherty and Steve Fleming, "Getting Students on Track to College and Career Readiness: How Many Catch Up from Far Behind?" ACT Research Report Series 2012-9 (Iowa City, IA: ACT, 2012), http://media.act.org/documents/ACT_RR2012-9.pdf.

9 The earlier report examined results by *school* demographics (for example, students in schools with more than 50% low-income students) based on schoolwide information available from the US Department of Education's Common Core of Data. However, we did not have separate information on low-income and non–low-income students in those schools.

10 Low-income students are defined as those eligible for the free and reduced-price lunch program. The numbers of low-income and non–low-income students add up to the number of "All Students."

11 In Arkansas and Kentucky, the great majority of these students were White. The numbers of African American, Hispanic, and "Other" students add up to the number of "All Students."

12 English language learners were those designated as such in the state enrollment or test database (for fourth graders) or the state enrollment database alone (for eighth graders). The same rule was applied for the student's low-income and special education status. In the cohort data, students were classified based on their status in the cohort's beginning year, e.g., fourth grade in a grades 4–8 cohort.

13 In Arkansas, we followed students who took ACT Explore as eighth graders in 2006–07 or 2007–08 and who took the ACT in eleventh or twelfth grade in the 2009–10, 2010–11, or 2011–12 school years. In Kentucky, we followed eighth-grade ACT Explore test takers from 2006–07, 2007–08, or 2008–09 and who took the ACT three years later in grade 11 in 2009–10, 2010–11, or 2011–12. For a more detailed description of the Arkansas and Kentucky cohorts in the study, see Chrys Dougherty, Linda Hiserote, and Teresa Shaw, "Catching Up to College and Career Readiness in Arkansas," (Iowa City, IA: ACT, 2014) and Dougherty, Hiserote, and Shaw, "Catching Up to College and Career Readiness in Kentucky," (Iowa City, IA: ACT, 2014).

14 The size of a standard deviation on ACT Explore (based on national data) was 4.2 points in English, 3.5 in mathematics, 3.9 in reading, and 3.3 in science.

15 Table 1 and the analysis in this study use the updated ACT Reading and Science Benchmarks released in 2013: 22 (vs. the earlier 21) in ACT Reading, and 23 (vs. the earlier 24) in ACT Science, with the ACT Explore and ACT Plan Benchmarks adjusted accordingly. The 2012 *Catching Up* report used the older Benchmarks. For details on the updated Benchmarks, see Jeff Allen, "Updating the ACT College Readiness Benchmarks," ACT Research Report 2013-6 (Iowa City, IA: ACT, 2013), http://www.act.org/research/researchers/reports/pdf/ACT_RR2013-6.pdf.

16 The starting years were 2006–07 and 2007–08 for the Arkansas cohorts and 2006–07, 2007–08, and 2008–09 for the Kentucky cohorts. Thus, Table 2 aggregates two years of eighth-grade data from Arkansas with three years of eighth-grade data from Kentucky. In all, 39,352 eighth-grade students (55% of total enrollment of 71,674 students) took ACT Explore in the two starting years in Arkansas and 128,511 students (91% of total enrollment of 140,827 students as determined by the Kentucky Core Competency Test database) took ACT Explore in the three starting years in Kentucky.

17 Much lower percentages from all demographic student groups scored at the Far Off Track level of 8 or below on the ACT Explore English test. For example, those percentages were 5% for low-income students, 7% for African Americans, 6% for Hispanics, 12% for English language learners, and 15% for special education students. Thus, we focused our analysis on Far Off Track students in the other three subjects.

18 Student groups disaggregated by income, ethnicity, English language learner, and special education status overlap, and it is also possible to disaggregate by more finely divided non-overlapping groups, e.g., low-income African American students. Some of this was done in the Appendix to the two papers by Dougherty, Hiserote, and Shaw cited earlier.

19 This is based on the assumptions that retained students and dropouts have lower academic achievement and are more likely to be low income than their peers who follow a normal grade progression.

20 In Arkansas, the fourth-grade Literacy test was matched to the eighth-grade ACT Explore Reading test. The logistic regression approach used to associate probabilities with each prior test score is described in Jeff Allen, "Updating the ACT College Readiness Benchmarks."

21 In both states, we followed students who took the state test in fourth grade in 2006–07 or 2007–08 and ACT Explore in eighth grade in 2010–11 or 2011–12.

22 All fourth-grade science scores were from Kentucky, as Arkansas tested science in fifth grade but not fourth grade.

23 A regression analysis that controlled both for how far behind students were and for the length of time between tests indicated that catching up by Far Off Track students in all three subjects was greater in the middle grades than in high school. However, this analysis did not address the test alignment issue. See the two papers cited earlier by Dougherty, Hiserote, and Shaw.

24 This approach is strongly recommended in the Common Core State Standards, which state that "while the Standards make references to some particular forms of content, including mythology, foundational US documents, and Shakespeare, they do not—indeed, cannot—enumerate all or even most of the content that students should learn. The Standards must therefore be complemented by a well-developed, content-rich curriculum consistent with the expectations laid out in this document" and that "By reading texts in history/social studies, science, and other disciplines, students build a foundation of knowledge in those 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* (2010), pp. 6 and 10, http://www.corestandards.org/.

25 Teaching all of these subjects in the early grades typically requires a carefully designed curriculum that is integrated across subjects. State standards are typically written subject-by-subject and do not provide this integration. School districts can develop such a curriculum on their own and/or use an existing integrated curriculum. For a description of such a curriculum, see Jennifer Dubin, "More Than Words: An Early Grades Reading Program Builds Skills and Knowledge," *American Educator*, Fall 2012, pp. 34-40, http://www.aft.org/pdfs/americaneducator/fall2012/Dubin.pdf.

26 For further discussion of the importance of a rich curriculum in the early grades, especially for disadvantaged students, see Chrys Dougherty, *College and Career Readiness: The Importance of Early Learning* (Iowa City, IA: ACT, 2013), http://www.act.org/research/policymakers/pdf/ImportanceofEarlyLearning.pdf.

27 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. Comprehension, on the other hand, depends heavily on the development of vocabulary and background knowledge. See E.D. Hirsch, "Reading Comprehension Requires Knowledge—of Words and the World," *American Educator,* Spring 2003, pp. 10-29 and 48-49, https://www.aft.org/pdfs/americaneducator/spring2003/AE_SPRNG.pdf; and E.D. Hirsch and Robert Pondiscio, "There's No Such Thing as a Reading Test," *The American Prospect*, June, 2010, http://prospect.org/article/theres-no-such-thing-reading-test.

28 In mathematics, the ability to do simple arithmetic and place numbers on the number line by first grade predicts mathematics performance in fifth grade. Involving 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. See David C. Geary, "Cognitive Predictors of Achievement Growth in Mathematics: A 5-Year Longitudinal Study," *Developmental Psychology* 47 (2011): 1539-1552, http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3210883/ and National Research Council, *Mathematics Learning in Early Childhood: Paths Towards Excellence and Equity* (Washington, DC: National Academies Press, 2009), http://www.nap.edu/catalog.php?record_id=12519.

29 In the behavioral area, one review of multiple studies found that 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. See 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, http://www.mentalhealthexcellence.org/wp-content/uploads/2013/10/SEL-MetaAnalysis.pdf.

30 For a discussion of these practices, see ACT, *Rising to the Challenge of College and Career Readiness: A Framework for Effective Practices* (Iowa City, IA: ACT, 2012), http://www.nc4ea.org/nc4ea/assets/File/RisingToChallenge_Aug2012_FINAL.pdf.

31 For a discussion of such a database in the context of high schools, see Chrys Dougherty, "Using the Right Data to Determine if High School Interventions are Working to Prepare Students for College and Careers," National High School Center, 2010, http://www.betterhighschools.org/docs/NCEA_CollegeCareerReadiness.pdf. The analysis in that paper found that simply completing and earning credit for mathematics courses at the Algebra II level and beyond was not sufficient to catch up Far Off Track students. Most likely, those students received passing grades in those courses without having mastered the content implied by the course titles. See Chrys Dougherty, Lynn Mellor, and Shuling Jian, "Orange Juice or Orange Drink? Ensuring that 'Advanced Courses' Live Up to Their Labels," 2006, http://files.eric.ed.gov/fulltext/ED519415.pdf.

32 Chrys Dougherty and Lynn T. Mellor, "Preparing Students for Advanced Placement: It's a PreK–12 Issue," in Philip M. Sadler, Gerhard Sonnert, Robert H. Tai, and Kristin Klopfenstein, ed., *AP: A Critical Examination of the Advanced Placement Program* (Cambridge: Harvard Education Press, 2010): 219-232.

33 See the articles by E.D. Hirsch and Hirsch and Pondiscio in note 27.

34 ACT, *How Much Growth Toward College Readiness is Reasonable to Expect in High School?* (Iowa City, IA: ACT, 2010), http://www.act.org/research/policymakers/pdf/ReasonableGrowth.pdf; ACT, *Principles for Measuring Growth Towards College and Career Readiness* (Iowa City, IA: ACT, 2012), http://media.act.org/documents/GrowthModelingReport.pdf.

35 For a brief discussion of facilitating research with longitudinal education data, see Institute for Education Sciences, "Forming Research Partnerships with State and Local Education Agencies," SLDS (Statewide Longitudinal Data Systems) Issue Brief 2, July 2012, http://nces.ed.gov/programs/slds/pdf/Data-Use-Issue-Brief-2_Research-Partnerships.pdf.