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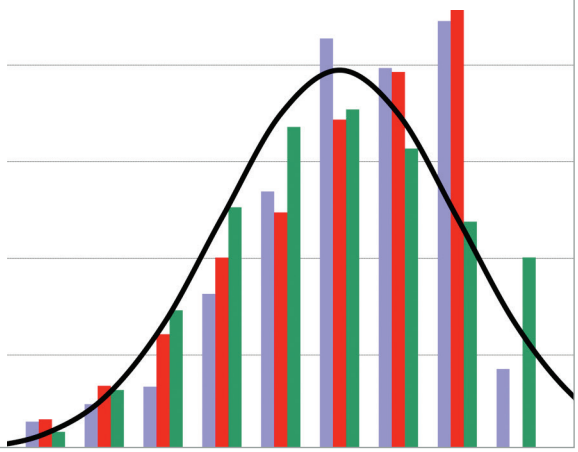

Catching Up to College and Career Readiness in Arkansas

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Abstract

This report focuses on the extent to which students who are academically far off track in fourth or eighth grade in Arkansas catch up by eighth or eleventh and twelfth grades. We studied two recent cohorts of Arkansas students whose eighth-grade ACT Explore® scores were more than one standard deviation below the ACT Explore Benchmark scores associated with being on track. We found that 9% or fewer of the students who were far off track in eighth grade attained the ACT College Readiness Benchmarks® by eleventh or twelfth grade. We did a similar analysis for two cohorts of students beginning in fourth grade, using scores on the Arkansas Benchmark Exams in literacy and mathematics in grade four and ACT Explore scores in reading and mathematics in grade eight. In this analysis, the percentage of far-off-track fourth-grade students who attained the ACT Explore Benchmark scores in grade eight ranged from 4% in mathematics to 6% in reading. We also found that students from at-risk groups—those who are low-income, African American, Hispanic, English language learners, or in special education—had lower catching up rates than their more advantaged peers. These results are of special concern because a large percentage of students from those groups are far off track in fourth and eighth grade.

These findings should underscore the importance of policies and practices that focus on getting students off to a good start in the early grades. These practices are especially important for disadvantaged students. Ongoing research should identify practices that help to accomplish this goal, and state and local policy should support efforts to disseminate and implement those practices.

Acknowledgements

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Catching Up to College and Career Readiness in Arkansas[1]

Introduction

In recent years educators and policymakers have set a goal that students graduate from high school ready for college and careers. However, as a nation we fall short of achieving this goal, particularly for disadvantaged students. In the states where the highest percentages of students took the ACT Assessment® in 2012, for example, 45% of students in the two lowest family income categories[2] met ACT's College Readiness Benchmarks in English, 21% in mathematics, 24% in reading, and 18% in science. In Arkansas, where 8,566 students from one of those two family income categories took the ACT, 51% of those students in English, 23% in mathematics, 28% in reading, and 19% in science met the ACT Benchmarks.[3]

A substantial body of research supports the idea that the path to college and career readiness begins in early childhood. Gaps in vocabulary development begin in very early childhood (Hart & Risley, 1995), and students entering kindergarten from disadvantaged backgrounds tend to lag behind their more advantaged peers in vocabulary and overall oral language development (Farkas & Beron, 2004; Dunham, Farkas, Hammer, Tomblin, & Catts, 2007) as well as in early reading and mathematics skills and background knowledge (West, Denton, & Germino-Hausken, 2000). In turn, early reading and mathematics skills and background knowledge predict student success in the later grades (Duncan, Claessens, Huston, Pagani, Engel, Sexton, Dowsett, Magnuson, Klebanov, Feinstein, Brooks-Gunn, Duckworth, & Japel, 2007; Claessens & Engel, 2013; Grissmer, Grimm, Aiyer, Murrah, & Steele, 2010; Geary,

[1] This study uses data maintained by the Arkansas Department of Education and is published with its permission.
[2] These two income categories together consist of students with a self-reported family income of less than $36,000 a year.
[3] These statistics are based on the updated Benchmarks of 22 in reading and 23 in science calculated in Allen (2013). The states with the highest percentages of students taking the ACT were Colorado, Illinois, Kentucky, Michigan, North Dakota, Tennessee, and Wyoming. The data file contained the most recent ACT scores of students who were twelfth graders in 2012; ACT scores for students who did not take the ACT in twelfth grade came from earlier grades and years.

2011). With these findings in mind, recent ACT reports have focused on the importance of getting students off to a good start in preschool and the early elementary grades (Sawyer, 2008; Sawyer & Gibson, 2012; ACT, 2012a; Dougherty, 2013).

Learning gaps that emerge early 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 (Stanovich, 1986). These effects can occur because students who already know about a topic often find it easier to learn new information on the same topic (Willingham, 2006), and because prior exposure to knowledge can motivate students to learn more (Durik & Matarazzo, 2009; Maltese & Tai, 2010). In addition, in order to catch up, students who are academically off track must grow faster than students ahead of them. The lagging students must do double duty, catching up on content that they missed earlier while mastering newly taught curriculum. Students who are already on track do not carry this extra burden.

This report follows up on the analysis in a recent ACT research report (Dougherty & Fleming, 2012). We used the recently updated ACT College Readiness Benchmarks (Allen, 2013) as a measure of high school students' academic preparation for two- and four-year colleges and other postsecondary training programs leading to skilled careers (ACT, 2006). These Benchmarks identify the ACT scores associated with a 50% probability of earning a B or a 75% chance of earning a C in entry-level college courses corresponding to the ACT subject tested (Allen & Sconing, 2005). We used the corresponding College Readiness Benchmarks on ACT Explore as indicators of whether eighth grade students are on track to meet the ACT Benchmarks. The report focuses on students who start out far off track—scoring more than one standard deviation below the ACT Explore Benchmark in eighth grade in a given subject, or

more than one standard deviation below the fourth-grade state test score associated with a 50% probability of reaching the ACT Explore Benchmark in eighth grade.

The next section discusses the methodology of our study. The two following sections look at results for students catching up in Grades 8-11/12 and Grades 4-8. Subsections of the report examine the percentage of far-off-track students from different demographic groups reaching the Benchmarks four years later and how far short of the Benchmarks the other students fell. Finally, the conclusion discusses implications of our findings for how educators and policymakers should think about intervention and accountability requirements.

Methodology

Students in the Analysis

Grades 8-12. For the analysis of students catching up in high school, we used data from four cohorts of Arkansas students who took the ACT Explore test in Grade 8 in the 2006-07 or 2007-08 school years and the ACT in Grade 11 or 12 (Table 1).[4] This analysis was possible in Arkansas because state education officials provided student-level enrollment, state test, ACT Explore, and ACT data from the state's longitudinal data system that could be matched across datasets and years using the state student ID. This made it possible to link the ACT Explore and ACT results to state enrollment and academic achievement test data, and to disaggregate ACT Explore and ACT results based on state-provided student demographic information.

[4] Students were followed through twelfth grade and their most recent ACT scores were used, so students listed as taking the ACT in eleventh grade did not take the ACT again in grade 12.

Table 1

Arkansas Grades 8-11 and 8-12 Student Cohorts

Student cohort	School year taking ACT Explore	School year taking the ACT	Grade last taking the ACT	Number of students*
2007-2010	2006-07	2009-10	11	1,152
2007-2011	2006-07	2010-11	12	9,029
2008-2011	2007-08	2010-11	11	1,745
2008-2012	2007-08	2011-12	12	9,121
Total (4 cohorts)				**21,047**

* 0.3% of tested students with incomplete demographic records were dropped from the analysis.

About 29% of enrolled Arkansas eighth graders were in the longitudinal cohorts in the study.[5] As might be expected, the students in the longitudinal cohorts in the study—representing students who stayed in school, followed a normal grade progression, remained in the state, and took both ACT Explore and the ACT— had lower percentages of students from typically at-risk groups than did the general population of eighth grade students. For example, students in the study were less likely to be low-income, African American, Hispanic, English language learners, or in special education (Table 2).[6] This means that any difficulty that students in the study had catching up would likely be amplified in the general student population, thus lending greater weight to the findings of this study about the difficulties experienced by far-off-track students.

[5] From Table 2, the 21,047 Arkansas cohort students were about 29% of the 71,674 total eighth grade population from the cohorts' eighth grade years.

[6] In Table 2, the demographic characteristics of each student was taken from the eighth grade data, so that comparison between longitudinal and eighth grade snapshot cohorts use the same information on each student. Moving from left to right, students in each column of Table 2 are a subset of those in the previous column.

Table 2

Demographics of Arkansas 8th Grade Students from 2006-07 and 2007-08 School Years

	Total number of 8th graders*	8th graders taking ACT Explore	8th grade ACT Explore takers in longitudinal cohorts
Number of students*	71,674	39,352	21,047
Percent low-income	52	51	42
Percent African American	23	24	22
Percent Hispanic	7	7	5
Percent English language learners	4	3	2
Percent special education	13	10	4

* 0.5% of enrolled students with incomplete demographic records were dropped from the analysis.

Grades 4-8. For the analysis of students catching up in upper elementary and middle school, we used data from two cohorts of Arkansas students who took the Arkansas Benchmark Exams (ABE) in literacy and mathematics in Grade 4 in the 2006-07 or 2007-08 school years and ACT Explore in Grade 8 four years later (Table 3). The population of students in the longitudinal cohorts who followed a normal grade progression and took the ACT Explore test in eighth grade was less at risk than the general population of all fourth grade tested students (Table 4). However, this difference was not as great as in the high school cohorts shown in Table 2.

Table 3

Arkansas Grades 4-8 Student Cohorts

Student cohort	School year taking 4th grade test	School year taking ACT Explore	Grade taking ACT Explore	Number of students*
2007-2011	2006-07	2010-11	8	26,653
2008-2012	2007-08	2011-12	8	27,128
Total (2 cohorts)				**53,781**

* Fewer than 0.1% of tested students with incomplete demographic records were dropped from the analysis.

Table 4

Demographics of Arkansas 4th Grade Students from 2006-07 and 2007-08 School Years

	Total number of 4th graders*	Tested 4th graders	Tested 4th graders in longitudinal cohorts
Number of students	72,973	69,818	53,781
Percent low-income	59	59	56
Percent African American	22	22	21
Percent Hispanic	9	8	8
Percent English language learners	6	6	6
Percent special education	17	15	11

* Fewer than 0.1% of enrolled students with incomplete demographic records were dropped from the analysis.

Disaggregation of Students into Demographic Groups

Grades 8-12 and 4-8. In addition to looking at all tested students, we disaggregated the students in the four longitudinal cohorts and the ACT Explore tested population as a whole into

19 additional subgroup categories, making 20 categories altogether. The first set of eight categories consists of:

1. All students
2. Low-income students
3. Non-low-income students
4. African American students
5. Hispanic students
6. Other students[7]
7. English language learners
8. Special education students[8]

An additional set of 12 categories disaggregates students by income, ethnicity, and gender:

9. Low-income African American males
10. Low-income African American females
11. Low-income Hispanic males
12. Low-income Hispanic females
13. Other low-income males
14. Other low-income females
15. Non-low-income African American males
16. Non-low-income African American females
17. Non-low-income Hispanic males

[7] The "Other" category consists of individuals who are neither African American nor Hispanic. In Arkansas, the great majority of those students are White. The three ethnic categories (4-6) are mutually exclusive, as are the two income categories (2 and 3).

[8] In addition, we looked at results for the following additional four categories not reported on in this paper: Hispanic English language learners, non-Hispanic English language learners, non-English language learners, and students not in special education.

18. Non-low-income Hispanic females
19. Other non-low-income males
20. Other non-low-income females

To keep the number of statistics in the paper to a manageable size, this report focuses on the first eight categories. However, information on students disaggregated by income, ethnicity, and gender is available in Appendix B.

Division of Students into Academic Preparation Groups

Grades 8-12. We classified eighth grade students into three academic preparation groups in each of four subject areas (English, mathematics, reading, and science) based on their performance on ACT Explore in these areas:

- "On-Track" students met the College Readiness Benchmark score on ACT Explore (Table 5) in the subject.[9]
- "Off-Track" students missed the Benchmark by one standard deviation or less.
- "Far-Off-Track" students scored more than a full standard deviation below the Benchmark.[10]

[9] Readers should note that reaching the ACT College Readiness Benchmark on the eighth grade ACT Explore test does not imply that the student is college-ready in eighth grade, only that he or she is on track to being college ready on the ACT by eleventh or twelfth grade.

[10] Standard deviations were chosen as the yardstick because they provide a common metric across different grades and tests. A one-standard deviation difference in scores is quite large: in reading and mathematics, it is roughly the difference between scoring at the Basic and Proficient levels on the National Assessment of Educational Progress (NAEP), or between the 16th and the 50th percentiles on a norm-referenced standardized test. The size of a standard deviation on Explore was 4.2 points in English, 3.5 in mathematics, 3.9 in reading, and 3.3 in science. Standard deviations on the ACT were 6.4 points in English, 5.3 in mathematics, 6.2 in reading, and 5.1 in science.

Table 5

Student Academic Preparation Levels on ACT Explore (Grade 8)

Academic preparation level	English	Mathematics	Reading	Science
On Track Met or exceeded the College Readiness Benchmark	13 or above	17 or above	16 or above	18 or above
Off Track No more than one standard deviation below the Benchmark	9 - 12	14 - 16	13 - 15	15 - 17
Far Off Track More than one standard deviation below the Benchmark	8 or below	13 or below	12 or below	14 or below

For example, a score of 16 or better in ACT Explore Reading 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. Similarly, Table 6 shows the ACT scores indicating that a student is On Track (meeting the ACT College Readiness Benchmark), Off Track, or Far Off Track. These Benchmarks, first set in 2005, were updated in 2013 based on more recent data linking students' ACT scores to their grades in credit-bearing first-year college courses (Allen, 2013; Allen & Sconing, 2005). In the update, the English and mathematics Benchmarks remained the same, while the ACT Benchmark in reading changed from 21 to 22 and in science from 24 to 23. Similarly, the eighth grade ACT Explore Benchmark changed from 15 to 16 in reading and 20 to 18 in science. We used these updated Benchmarks for all years of data in this report.

Table 6

Student Academic Preparation Levels on the ACT

Academic preparation level	English	Mathematics	Reading	Science
On Track Met or exceeded the College Readiness Benchmark	18 or above	22 or above	22 or above	23 or above
Off Track No more than one standard deviation below the Benchmark	12 - 17	17 - 21	16 - 21	18 - 22
Far Off Track More than one standard deviation below the Benchmark	11 or below	16 or below	15 or below	17 or below

In ACT Explore English, few students scored at the Far Off Track level of 8 or below. Thus, we focused our analysis of Far Off Track students in the other three subjects.

Grades 4-8. Similarly, we classified fourth grade students in the two Arkansas cohorts as On Track, Off Track, and Far Off Track based on their scores on the Arkansas Benchmark Exams (ABE). This classification was based on a direct link between students' fourth grade ABE scores in literacy and mathematics and their eighth grade ACT Explore reading and mathematics scores. This was done by using logistic regression to identify the fourth grade ABE score in each subject associated with a 50% or better probability of meeting or exceeding the eighth grade Benchmark on ACT Explore in the corresponding subject.[11] Data from both cohorts was

[11] Students were classified into two categories based on whether they did or did not meet the ACT Explore benchmark in a subject, and a logistic regression model such as the one described in Allen (2013) was used to assess the probability of meeting the ACT Explore benchmark in the subject as a function of the student's fourth grade ABE score in the same subject. The fourth grade ABE literacy test, which covers both reading and writing, was treated as the closest same-subject match to the eighth grade ACT Explore reading test.

combined for this analysis. This led to the identification of the fourth grade academic preparation levels shown in Table 7.[12]

Table 7

Student Academic Preparation Levels on the Grade 4 Arkansas State Test

Academic preparation level	Literacy	Mathematics
On Track Met or exceeded the College and Career Readiness Target	772 or above	675 or above
Off Track No more than one standard deviation below the Target	586 - 771	575 - 674
Far Off Track More than one standard deviation below the Target	585 or below	574 or below

Classification of Far-Off-Track Students Based on Their Amount of Catching Up

Grades 8-12. For each Far Off Track student in a given subject, we calculated the difference between the student's eighth grade ACT Explore score and the ACT Explore College Readiness Benchmark in that subject. For example, consider a hypothetical student with a score of 10 on the ACT Explore reading test. This student has a *scale score gap* of -6 relative to the

[12] These preparation levels will be slightly different from those identified using different years' data or a different linking methodology, e.g., the one described in ACT (2012b) and Dougherty & Fleming (2012). Most of the difference between the On Track targets shown in Table 7 and those developed by Dougherty & Fleming (2012) is due to the updating of the Explore reading Benchmark from 15 to 16 and the use of fourth grade data from the 2007-08 school year as well as from 2006-07. When 2006-07 data are used with the new Benchmarks, and only the linking methodology is different, the On Track targets differ by 4 ABE scale score points in mathematics (about .04 standard deviation) and 13 ABE score points in literacy (about .07 standard deviation). Incorporating data from the 2007-08 school year in addition to the different linking methodology causes the On Track targets to differ by 16 points in mathematics (about .16 standard deviation) and 15 points in literacy (about .08 standard deviation).

ACT Explore Benchmark score of 16.[13] (The gap is negative to emphasize that the student falls short of the Benchmark.) If the same student scores 16 on the ACT, the student's scale score gap is -6 relative to the ACT Reading Benchmark of 22, the same as the student's scale score gap on ACT Explore. An ACT reading score of 19, on the other hand, would constitute a gap of -3, and the student would have closed half of the ACT Explore score gap. A student scoring at or above the Benchmark on the ACT would have closed all of the gap.

Score gaps can also be measured in standard deviation units. In that case, we refer to them as *z-score gaps*. The definitions of Off Track and Far Off Track students in Tables 5-7 are based on z-score gaps. For example, our hypothetical student with an ACT Explore reading score of 10 has a z-score gap of about –1.54 (i.e., –6/3.9, where 3.9 is the standard deviation of ACT Explore reading scores). This places the student in the Far Off Track group, as the student scores more than one standard deviation below the Benchmark. If the same student scores 16 on the ACT, the scale score gap is unchanged but the z-score gap narrows to –.97 (i.e., –6/6.2, where 6.2 is the standard deviation of ACT reading scores), and the student is counted in the Off Track group. Z-score gaps adjust for the wider dispersion of student scores on the ACT than on ACT Explore. Analogously, a 15-pound weight gap is a larger share of typical weight differences among 5-year-olds than it is among 30-year-olds, so a five-year-old who is 15 pounds overweight might be considered to be "more overweight" than a 30-year-old who is 15 pounds overweight. This may be small consolation to the 30-year-old who must still make the effort to lose 15 pounds. So both score gaps and z-score gaps are useful measures of how far students fall short of On Track Benchmarks.

[13] "Scale scores" are the familiar ACT Explore and ACT scores reported on a scale from 1 to 25 and 1 to 36, respectively. They are distinguished from "raw scores" which represent the percentage of test items correct, and other forms of score reporting such as stanines, percentile ranks, and grade equivalents that are used on norm-referenced tests.

Using score gaps as the metric, we classified students who scored Far Off Track on a given academic subject on ACT Explore into four *scale score growth categories* based on how much they closed their scale score gaps in the same subject when they took the ACT (Table 8). Likewise, we divided those students into four *z-score growth categories* based on how close they came to reaching the ACT Benchmarks (Table 9).

Table 8

ACT Explore-ACT Scale Score Growth Categories for Far Off Track Students

Category 1	"Reached Benchmark": the student closed the entire ACT Explore scale score gap by scoring at or above the ACT College Readiness Benchmark.
Category 2	"Closed half or more of gap": the student's ACT Explore scale score gap narrowed by half or more on the ACT.[14]
Category 3	"Closed gap by less than half": the student's ACT Explore scale score gap narrowed on the ACT, but by less than half.
Category 4	"No gap closing": the student's ACT Explore scale score gap stayed the same or widened on the ACT.

[14] This is a less stringent criterion than proposed in ACT (2009), which suggested that Off-Track students be expected to close half the point gap between Explore and Plan and half of the gap again between Plan and the ACT, or three-quarters of the gap altogether between Explore and the ACT.

Table 9

ACT Explore-ACT z-Score Growth Categories for Far Off Track Students Based on the Change in the Student's Academic Performance Level

Category 1	"Reached Benchmark": the student moved from Far Off Track on ACT Explore to scoring at or above the ACT College Readiness Benchmark.
Category 2	"Reached top half of Off Track level": the student moved from Far Off Track to scoring in the top half of the Off Track performance level on the ACT.[15]
Category 3	"Reached bottom half of Off Track level": the student moved from Far Off Track to scoring in the bottom half of the Off Track performance level on the ACT.
Category 4	"Stayed Far Off Track": the student remained in the Far Off Track category on the ACT.

To see how students are placed in these categories, consider our far-off-track eighth-grade student with an ACT Explore reading score of 10, representing a scale score gap of -6 and a z-score gap of -1.54 relative to the Explore reading benchmark of 16. If the student later scores at or above the College Readiness Benchmark of 22 on the ACT reading test, that student attains Category 1 on both growth metrics. To reach Category 2 on scale score growth, the student must score 19-21 on the ACT, reducing the scale score gap relative to the Benchmark to 3 points or less. To reach Category 2 on z-score growth, the student must score no more than one-half standard deviation below 22, also a score of 19-21. (A half standard deviation in ACT reading is 6.2/2 = 3.1 points.) For Category 3 on scale score growth, the student must score 17 or 18 on the ACT; a score of 16 or below would fail to narrow the 6-point gap relative to the Benchmark, thus leaving the student in Category 4. In comparison, an ACT score of 16-18 places the student in

[15] The ACT scores required to reach this category are 15 in English, 20 in mathematics, 19 in reading, and 21 in science. See the standard deviations listed in footnote 10.

Category 3 on z-score growth, since the borderline between Category 3 and 4—one standard deviation below the Benchmark—falls between an ACT score of 15 and 16.[16]

Scale score growth measures between two tests depend on the tests having a common vertical scale, as is the case for ACT Explore and the ACT. Z-score growth measures can be used even if no such scale exists, as long as the subject matter of the two tests is similar enough for the concept of "growth" to be meaningful.

Because the scores of any predefined group of students contains an error component that is positive on average for students chosen from near the top of the score distribution and negative on average for students chosen from near the bottom, all averages of groups of students *chosen based on their prior performance* tend to move back toward the average of all students. Using a sports analogy, a group of baseball players chosen for the highest batting averages in the first six weeks of the season will probably bat at a lower average for the rest of the season, even if they continue to bat well above the average for all players (Campbell & Kenny, 1999). This *regression effect* tends to reduce the expected future growth of On Track students and increase the expected future growth of Far Off Track students.[17] Possibly offsetting this regression effect are Matthew effects, which give an advantage to the students with better prior academic preparation.[18]

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[16] Note that the z-score categories only depend on the student's ending point, whereas the scale score categories also depend on how far behind the Far-Off-Track student starts.

[17] In eighth grade, the cut scores for being On Track (shown in Table 5) were slightly below the Arkansas Explore score mean of 13.6 in English but above the Arkansas means of 14.6 in mathematics, 13.8 in reading, and 15.7 in science. Thus any On Track score was above the state average in three of the four subjects.

[18] Faster growth of groups of previously higher performing students than of groups of lower performing students is highly suggestive of Matthew effects. In fact, because of regression to the mean, the *same* growth by groups of previously higher performing students could be suggestive of these effects. On the other hand, the fact that individual scores diverge over time is not in itself proof of Matthew effects, as individual scores will spread out over time even if current period score growth is uncorrelated with growth or performance levels in prior periods – think of the spreading out of an ink blot even if all movement of ink molecules is random and unrelated to prior position or movement. Note also that growth comparisons of student groups that begin at different levels depend on the assumption that the score scale has equal-interval properties – that is, growth from 10 to 15 has the same meaning as growth from 20 to 25.

Scale scores but not z-scores can be used to look for Matthew effects, as z-scores "adjust out" the increased spread of scores over time, including any divergence of groups of students that might be attributable to Matthew effects. Z-score measures do not, on the other hand, remove regression effects. Therefore any z-score measure will always show the top students declining and the bottom students improving, even if their scale scores diverge. Thus, it is not sufficient just to see if Far Off Track students' z-scores improve, but whether they improve enough to bring them close to the Benchmarks. That is the reason for emphasizing the student's ending point when looking at z-scores.

The academic preparation level measures (Far Off Track, Off Track, and On Track) and growth category measures used in this report are subject-specific. A student might be Far Off Track in ACT Explore reading and/or achieve little growth in that subject between ACT Explore and the ACT, but perform very well in ACT Explore mathematics and/or achieve strong mathematics growth between ACT Explore and the ACT.

Grades 4-8. We used students' Arkansas Benchmark Exam scores in literacy and mathematics in Grade 4 and the ACT Explore scores in reading and mathematics in Grade 8 as our endpoints for student growth. As the ABE and ACT Explore tests are not scored on a common vertical scale, no scale score growth measure exists between the two sets of tests.[19] However, academic performance levels and growth measure can be calculated based on the number of standard deviations that students scored below the On Track measure on each test. Thus, fourth grade Far Off Track students were classified into the four z-score growth categories shown in Table 9 based on the performance level they reached on ACT Explore in eighth grade.

[19] For example, while the Explore is scored on a scale from 1 to 25 in each subject, the 2008 fourth grade ABE scale scores ranged from 24 to 987 in literacy and 113 to 966 in mathematics. Also, the fourth grade ABE literacy and eighth grade ACT Explore reading tests cover overlapping but not identical subject matter, as the literacy exam covers reading and writing and the ACT Explore reading test covers reading only.

Because z-score growth measures were available at both levels (grades 4-8 and 8-12), we focus on those measures in the main body of this report. Appendix A contains a discussion of scale score growth by Arkansas students in grades 8-12.

Results

Closing Academic Preparation Gaps in High School

What Percentage of Students Were Far Off Track in 8th Grade?

Table 10 shows the percentage of ACT Explore eighth grade test-takers in Arkansas who were Far Off Track in the 2006-07 and 2007-08 school years, the starting years for the students in the four cohorts in this study. Between 30% and 43% of students in the overall population were Far Off Track in 2006-07 and 2007-08 (top row of Table 10), depending on the subject tested. These percentages were considerably higher for students in at-risk student groups, as can be seen from the remaining rows. For example, roughly 41, 55, and 45 percent of low-income students were Far Off Track in mathematics, reading, and science, respectively.

Table 10

Percentage of Arkansas ACT Explore Tested 8th Grade Students Who Were Far Off Track from 2006-07 and 2007-08 School Years

Group	Category	Number of students	Percentage of 8th graders who were Far Off Track		
			Mathematics	Reading	Science
1	All students	39,352	30	43	35
2	Low-income	19,941	41	55	45
3	Non-low-income	19,411	20	30	25
4	African American	9,261	50	66	54
5	Hispanic	2,612	37	52	40
6	Other[20]	27,479	23	34	28
7	English language learners	1,179	54	70	52
8	Special education	3,900	78	83	72

As Table 11 shows, the percentages of Far Off Track students were lower for students in our longitudinal cohorts, who stayed in school, made normal progress through the grades, remained in the state, and took the ACT college readiness assessment in grade 11 or 12. Not only were the students in these cohorts less likely to be from at-risk groups (Table 2), but the

[20] As mentioned in an earlier footnote, the "Other" category consists of students who are neither African American nor Hispanic. Thus, the sum of the number of students in the African American, Hispanic, and Other categories equals the total number of students in the top row. Likewise, the number of low-income and non-low-income students adds up to the number in the top row.

longitudinal cohort students from at-risk groups were less likely than others in their demographic groups to be Far Off Track.[21]

Table 11

Percentage of Arkansas ACT Explore Tested 8th Grade Students Who Were Far Off Track from Students in Longitudinal Cohorts, 2006-07 and 2007-08 School Years

			Percentage of 8th graders who were Far Off Track		
Group	Category	Number of students	Mathematics	Reading	Science
1	All students	21,047	17	30	23
2	Low-income	8,739	26	42	32
3	Non-low-income	12,308	11	21	16
4	African American	4,652	36	55	42
5	Hispanic	1,085	24	38	27
6	Other	15,310	11	22	16
7	English language learners	361	36	58	39
8	Special education	865	64	74	58

[21] For example, the percentages of Far Off Track students among eighth grade low-income students *not* in the longitudinal cohorts were 46%, 58%, and 49% in mathematics, reading, and science, respectively.

What Percentage of Far Off Track 8th Graders Reached College Readiness Benchmarks by 11th or 12th Grade?

Based on an analysis of the Arkansas longitudinal cohorts, few Far Off Track eighth grade students reached the ACT College Readiness Benchmarks by eleventh or twelfth grade. Only about 3% of Far Off Track eighth graders met the ACT Benchmark in mathematics, 9% in reading, and 6% in science (Figure 1).[22] Success rates for Off Track students were higher: 19% in mathematics, 32% in reading, and 18% in science. By contrast, the majority of On Track eighth graders met the ACT Benchmarks in Grade 11 or 12.

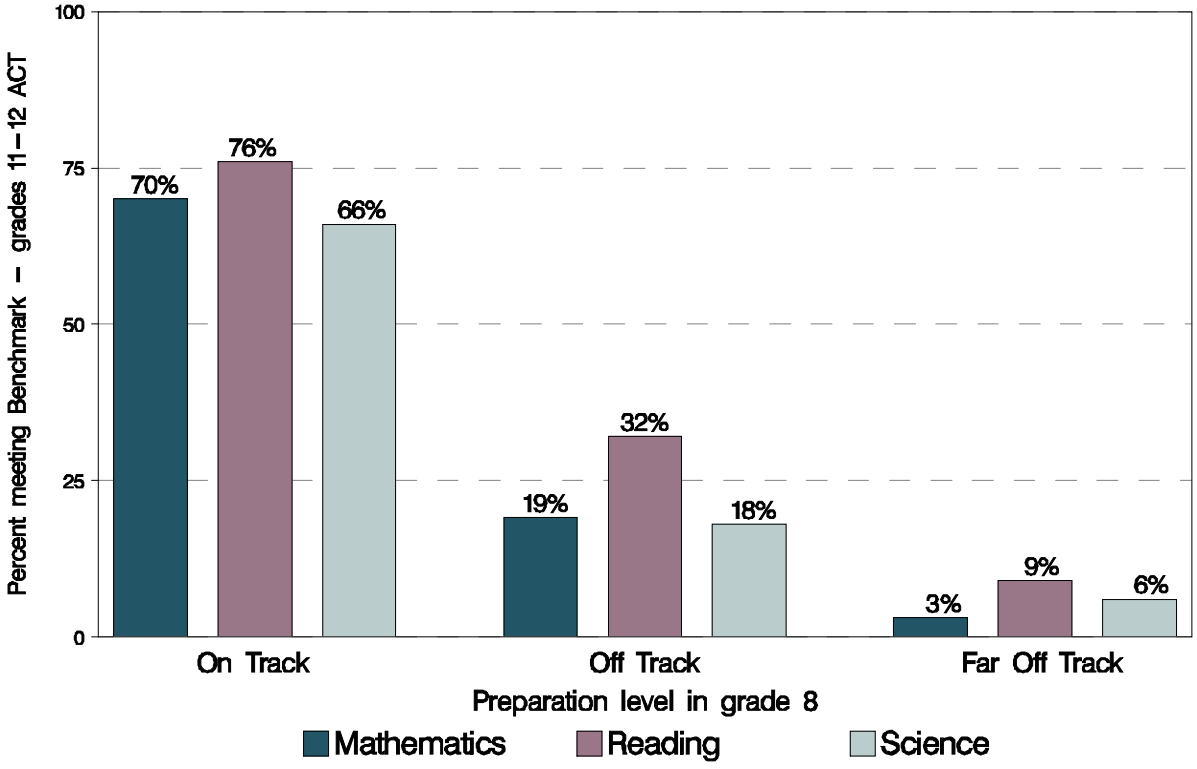

Figure 1. Percent of Arkansas students meeting the ACT College Readiness Benchmarks in grades 11-12, given their eighth grade ACT Explore performance

[22] Results for English are not included in this chart because, as noted earlier, few students scored at the Far Off Track level of 8 or below on the Explore English exam.

Figure 1 combines results for students taking the ACT for the final time in twelfth grade (about 86% of students in the longitudinal cohorts) and those taking the ACT for the last time in grade 11. The twelfth grade ACT takers might be expected to do better because they had more time to grow between ACT Explore and the ACT (an average of 4.1 vs. 3.2 years, respectively). On the other hand, the eleventh graders may have benefitted from selection bias, as they may have had many of the stronger students who took the ACT early and were satisfied with their scores. In fact, the twelfth grade ACT takers did better: rounding off to the nearest percent, twelfth grade ACT takers from the eighth grade On Track group stayed on track at a rate of 71%, 76%, and 66% in mathematics, reading, and science, respectively, versus 63%, 74%, and 65% for their eleventh grade counterparts; Far Off Track students taking the ACT in twelfth grade reached the Benchmark at a rate of 3%, 9%, and 6% in those three subjects, versus 1%, 6%, and 5% for students taking the ACT for the last time in eleventh grade.[23]

How Did the Percentage of Far Off Track 8th Graders Reaching Benchmarks by 11th or 12th Grade Vary Across Student Demographic Groups?

Figure 2 shows how the percentages of Far Off Track eighth grade students reaching College Readiness Benchmarks by eleventh or twelfth grade varied between low-income and non-low-income students. Figure 3 provides the same information by student ethnic category, and Figure 4 provides this information for English language learner and special education

[23] Selection bias favoring students who took their last test in eleventh grade appears to be small. Average eighth grade Explore scores in mathematics, reading, and science for those students were 15.9, 15.1, and 16.8, respectively, versus 15.9, 14.8, and 16.6 for students taking the ACT for the last time in twelfth grade. Looking at scale score growth between Explore and the ACT, students taking the ACT for the last time in eleventh grade had more growth per year (1.2, 1.6, and 1.0 points in reading, mathematics, and science, versus 1.1, 1.5, and 0.9 for the twelfth grade group). However, because they had more time to grow, the twelfth grade group had higher overall score growth between Explore and the ACT (4.3, 6.0, and 3.7 points in reading, mathematics, and science, versus 3.8, 5.1, and 3.1 points for the eleventh graders).

students.[24] These charts show that Far Off Track students from at-risk groups such as low-income students, minority students, English language learners, and special education students reached the Benchmarks at lower rates than did their less at-risk counterparts. This is a matter of concern given that students from these groups are more likely to be Far Off Track in the first place (Tables 10 and 11).

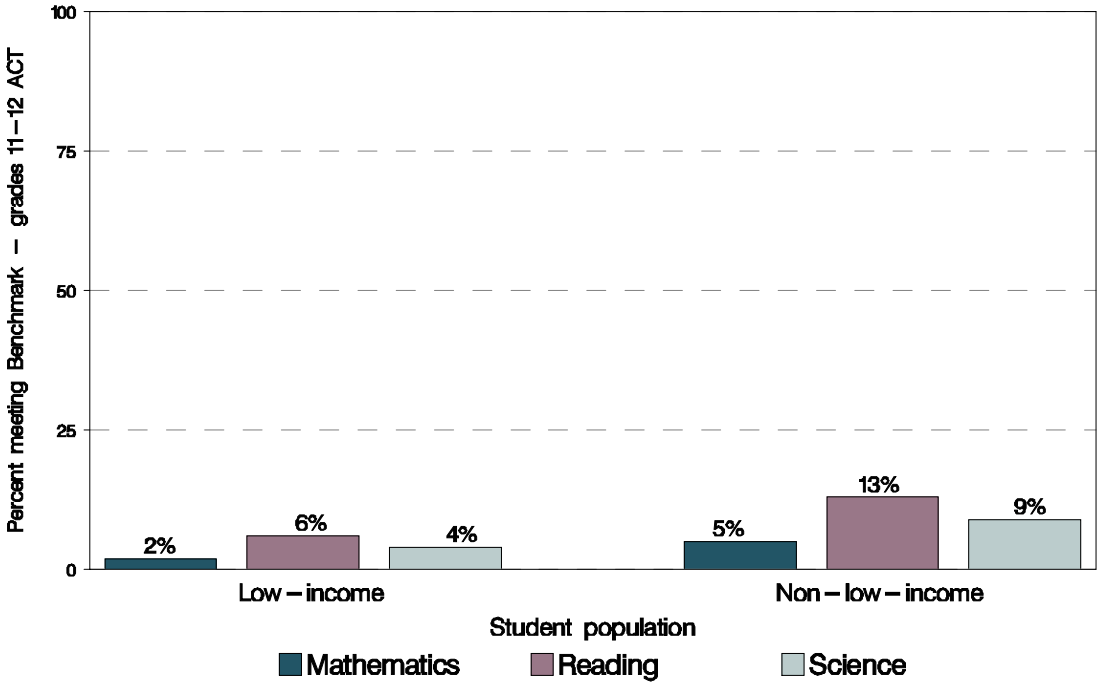

Figure 2. Percent of Far Off Track eighth grade students meeting College Readiness Benchmarks on the ACT in grade 11 or 12, by student income category.

[24] The large amount of white space in these charts is deliberate, intended to emphasize the low rate of catching up of Far Off Track students from all demographic categories.

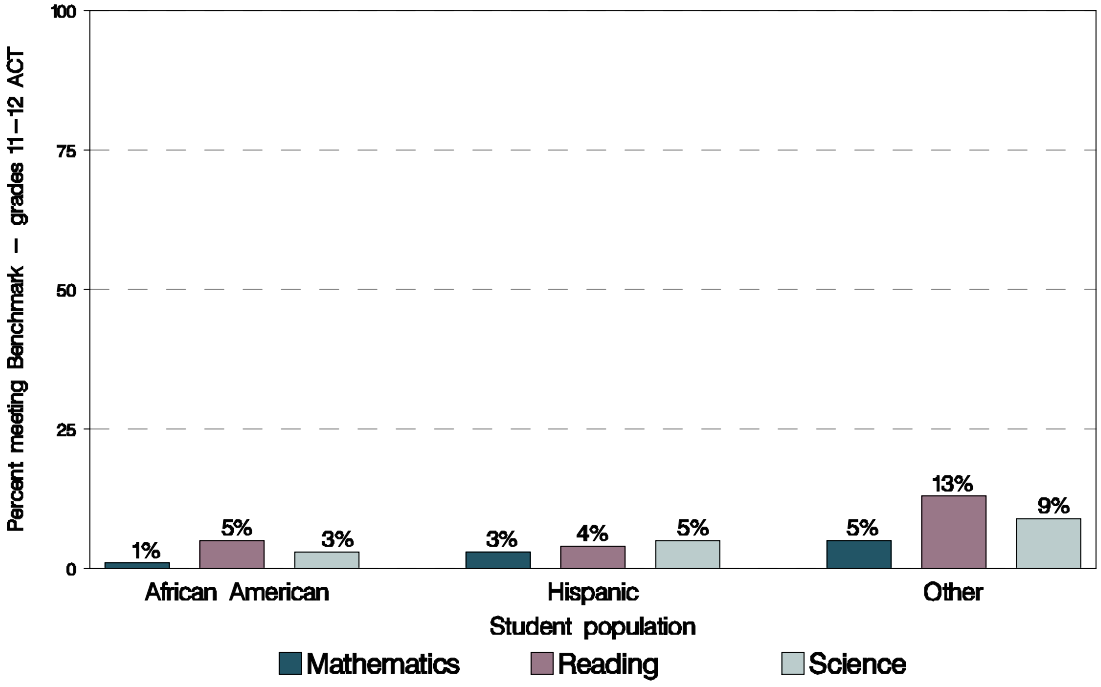

Figure 3. Percent of Far Off Track eighth grade students meeting College Readiness Benchmarks on the ACT in grade 11 or 12, by student ethnic category.

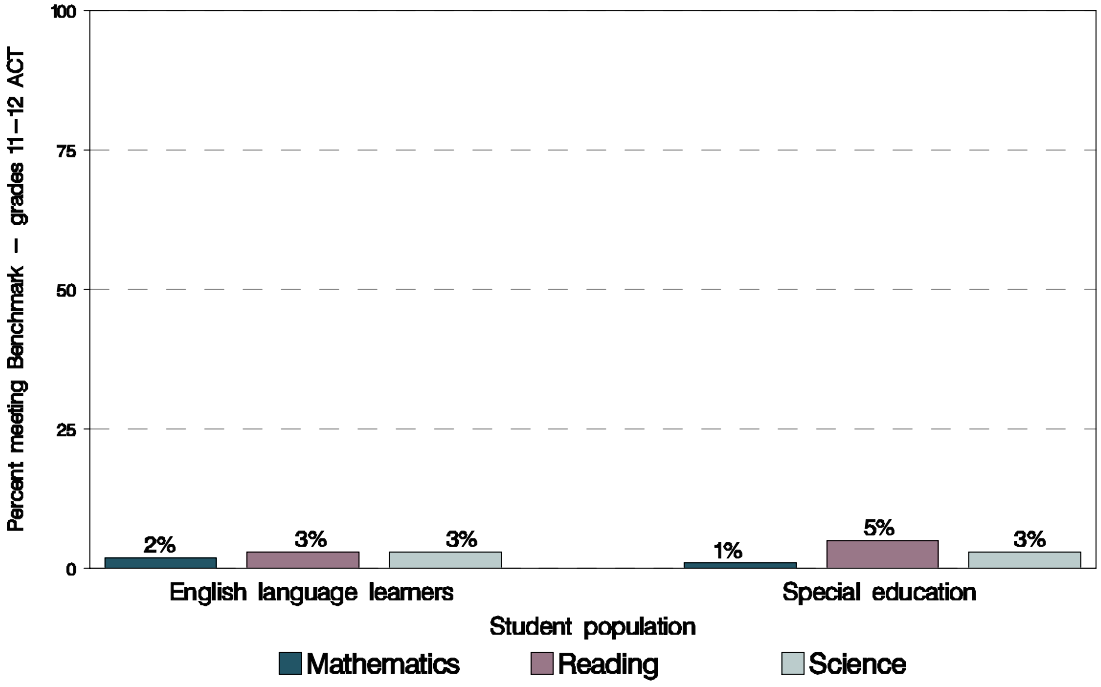

Figure 4. Percent of Far Off Track eighth grade students meeting College Readiness Benchmarks on the ACT in grade 11 or 12, for English language learners and special education students.

How Much Growth Towards College Readiness Benchmarks Did Far Off Track Students Achieve in High School?

To address this question, we disaggregated students into the z-score growth categories described in Table 9. We examined how many Far Off Track students either reached or moved up close to the Benchmark, as represented by the top two z-score growth categories. These students are shown in the first and second bar segments in Figures 5-8 on pages 25 and 26 of this report. (The "Reached Benchmark" category in these charts shows the same statistics as in Figures 1-4.) For example, the overall percentage of Far Off Track students in the top two z-score growth categories (reaching the Benchmark or moving to no more than a half standard deviation below it) was 6% in mathematics, 25% in reading, and 15% in science (Figure 5). For low-income students, the corresponding totals were 4% in mathematics, 20% in reading, and 11% in science (Figure 6).

It is also useful to look at the percentage of Far Off Track students who remained Far Off Track, represented by the lowest growth category in Table 9 and the last bar segment in Figures 5-8. For low-income students, these percentages were 77% in mathematics, 52% in reading, and 62% in science (Figure 6). African American and special education students were the most at-risk groups based on the percentage of students staying Far Off Track in high school: 83, 58, and 67 percent of African American students remained Far Off Track in mathematics, reading, and science, respectively (Figure 7), while the corresponding statistics for special education students were 88, 69, and 73 percent (Figure 8).[25]

[25] As discussed in the methodology section, score metrics based on z-scores cannot be used to examine Matthew effects, as dividing by the standard deviation removes the effect of increasing variance in test scores over time.

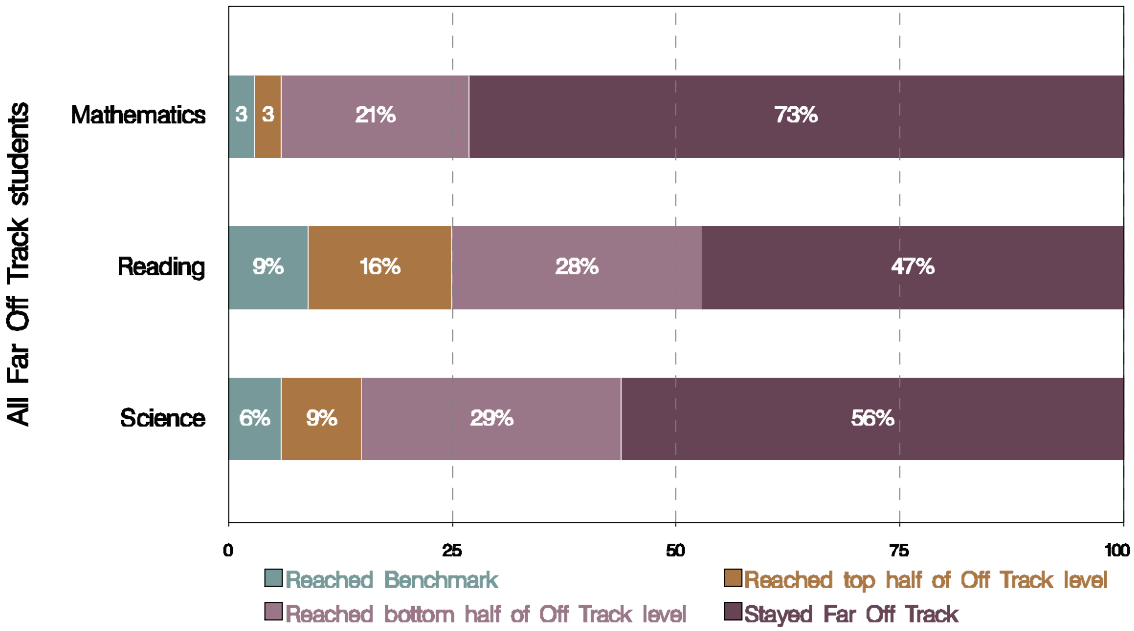

Figure 5. Percent of Arkansas Far Off Track students changing academic preparation levels in grades 8-11 or 8-12, by subject.

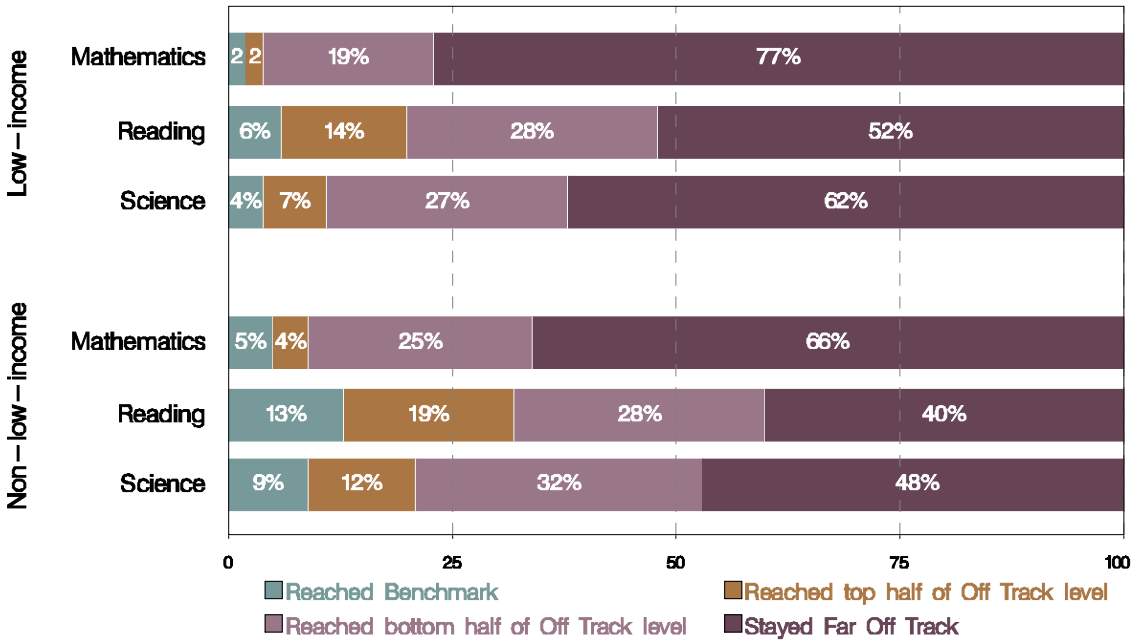

Figure 6. Percent of Arkansas Far Off Track students changing academic preparation levels in grades 8-11 or 8-12, by subject and income.

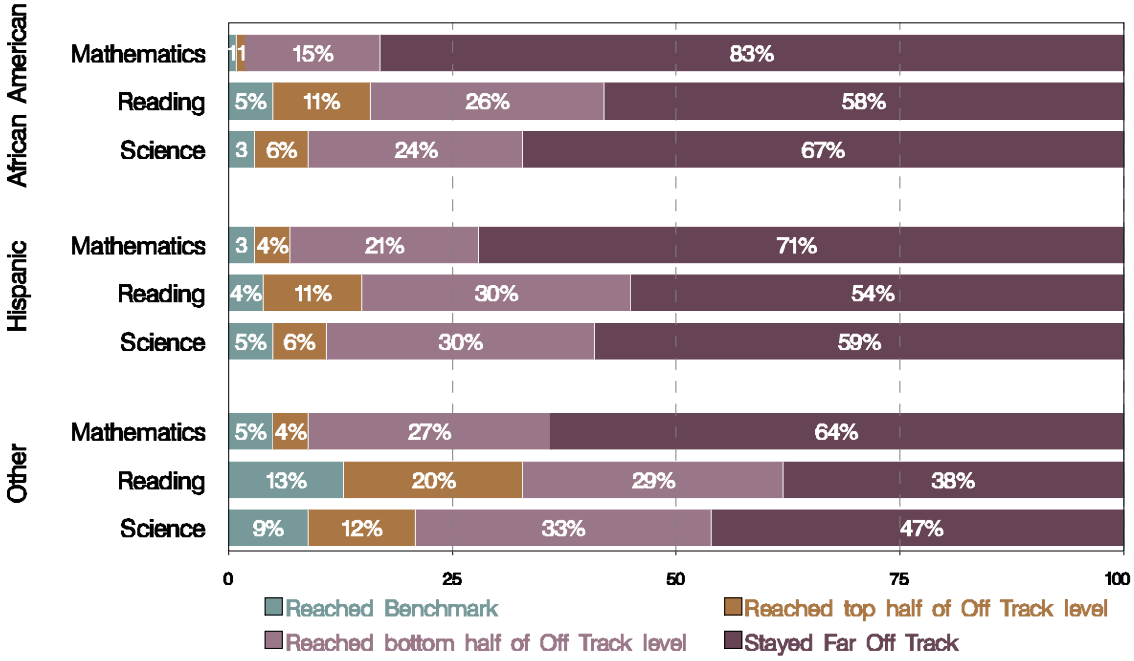

Figure 7. Percent of Arkansas Far Off Track students changing academic preparation levels in grades 8-11 or 8-12, by subject and ethnicity.

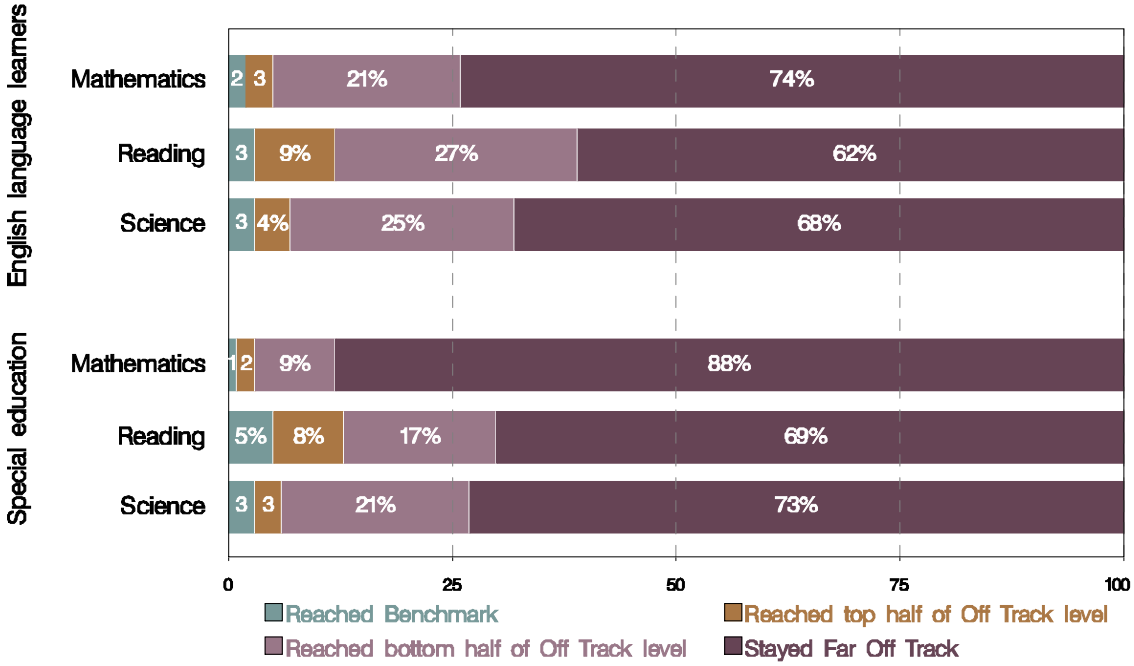

Figure 8. Percent of Arkansas Far Off Track English language learners and special education students changing academic preparation levels in grades 8-11 or 8-12, by subject.

Closing Academic Preparation Gaps between Grades 4 and 8

What Percentage of Students Were Far Off Track in 4th Grade?

Table 12 shows the percentage of fourth grade ABE test-takers in Arkansas who were Far Off Track in the 2006-07 and 2007-08 school years, the starting years for the students in the two Grades 4-8 cohorts in this study. 36% and 44% of students were Far Off Track in mathematics and literacy, respectively (top row of Table 12). These percentages were higher for students in at-risk student groups, as can be seen from the remaining rows. Students in the longitudinal cohorts (Table 13) were Far Off Track at lower rates, reflecting the better initial preparation of this subset of students who followed a normal grade progression between grades 4 and 8 and took ACT Explore in eighth grade.[26]

[26] An exception was students in special education, for whom students in the longitudinal cohorts were Far Off Track at higher rates. Data on attrition of special education students by type of disability might be helpful in casting light on this issue.

Table 12

Percentage of Arkansas Tested 4th Grade Students Who Were Far Off Track from 2006-07 and 2007-08 School Years

Group	Category	Number of students	Percentage of 4th graders who were Far Off Track	
			Mathematics	Literacy
1	All students	69,534	36	44
2	Low-income	40,798	47	55
3	Non-low-income	28,736	22	28
4	African American	15,424	59	64
5	Hispanic	5,889	46	58
6	Other	48,221	28	36
7	English language learners	4,502	53	66
8	Special education	10,736	63	75

Table 13

Percentage of Arkansas Tested 4th Grade Students Who Were Far Off Track from Students in Longitudinal Cohorts, 2006-07 and 2007-08 School Years

Group	Category	Number of students	Percentage of 4th graders who were Far Off Track	
			Mathematics	Literacy
1	All students	53,781	33	40
2	Low-income	30,201	43	51
3	Non-low-income	23,580	20	26
4	African American	11,103	56	61
5	Hispanic	4,534	43	55
6	Other	38,144	25	32
7	English language learners	3,399	50	64
8	Special education	5,835	68	81

However, the differences in Far Off Track rates for the same student groups between Tables 12 and 13 are less than those between Tables 10 and 11, most likely because student attrition from the grades 4-8 cohorts was less than in high school. For example, the 53,781 students in the "All Students" group in Table 13 represents 77% of the 69,534 students in Table 12, whereas the 21,047 students in the corresponding group in Table 11 represent 53% of the 39,352 students in Table 10. In addition, cohort attrition may be more closely related to academic

performance in high school (e.g., students drop out, are retained in grade, or choose not to take the ACT) than in the middle grades.

What Percentage of Far Off Track 4th Graders Were On Track by 8th Grade?

For the Arkansas longitudinal cohorts in the study, only about 4 and 6 percent of Far Off Track fourth graders reached the ACT Explore College Readiness Benchmarks by eighth grade in mathematics and reading, respectively (Figure 9). Success rates for Off Track students were higher: 30% in mathematics and 31% in reading. As was the case in high school, the majority of On Track fourth graders were still on track four years later.

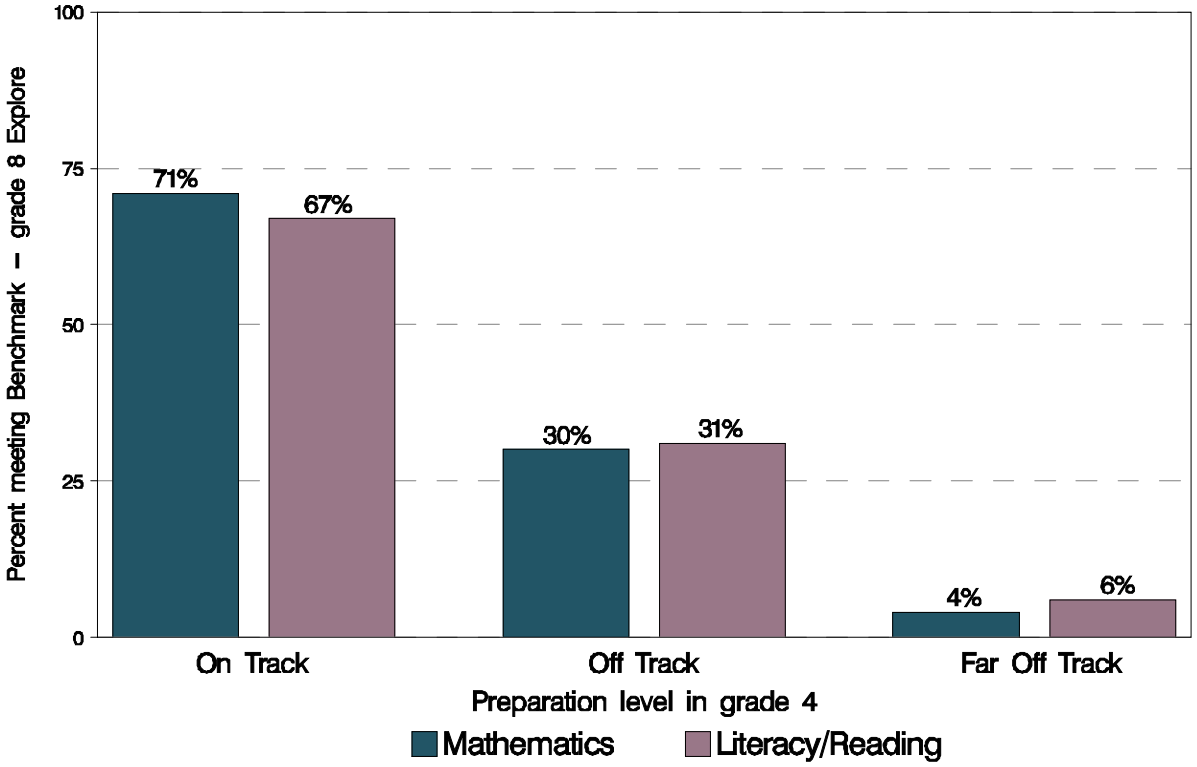

Figure 9. Percentage of Arkansas students meeting the ACT College Readiness Benchmarks on Grade 8 ACT Explore, given their fourth grade ABE performance.

How Did the Percentage of Far Off Track 4th Graders Getting On Track by 8th Grade Vary Across Student Demographic Groups?

Figure 10 shows how the percentages of Far Off Track fourth grade students getting on track by the eighth grade ACT Explore varied between low-income and non-low-income students. Figure 11 provides the same information by student ethnic category, and Figure 12 provides this information for English language learner and special education students. These charts show that Far Off Track students from at-risk groups caught up at lower rates than did their less at-risk counterparts. Students from these groups were also more likely to be Far Off Track in the first place, as shown in Tables 12 and 13.[27]

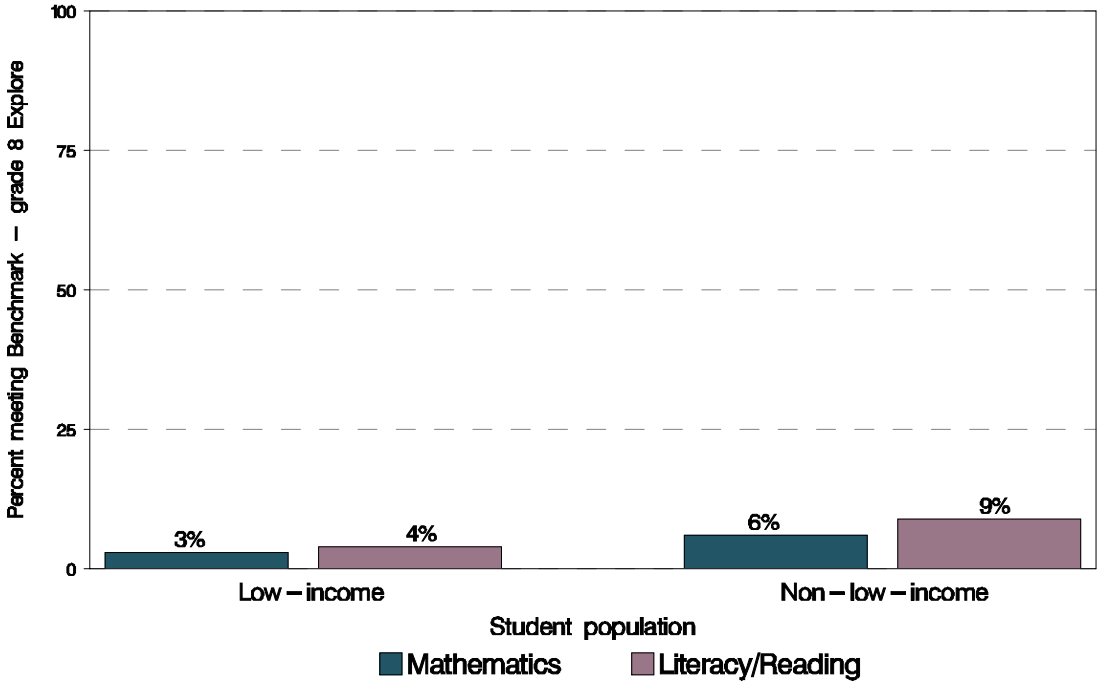

Figure 10. Percentage of Far Off Track fourth grade students getting On Track by the 8th grade ACT Explore, by student income category.

[27] Results for the other disaggregated student categories are available in Appendix B.

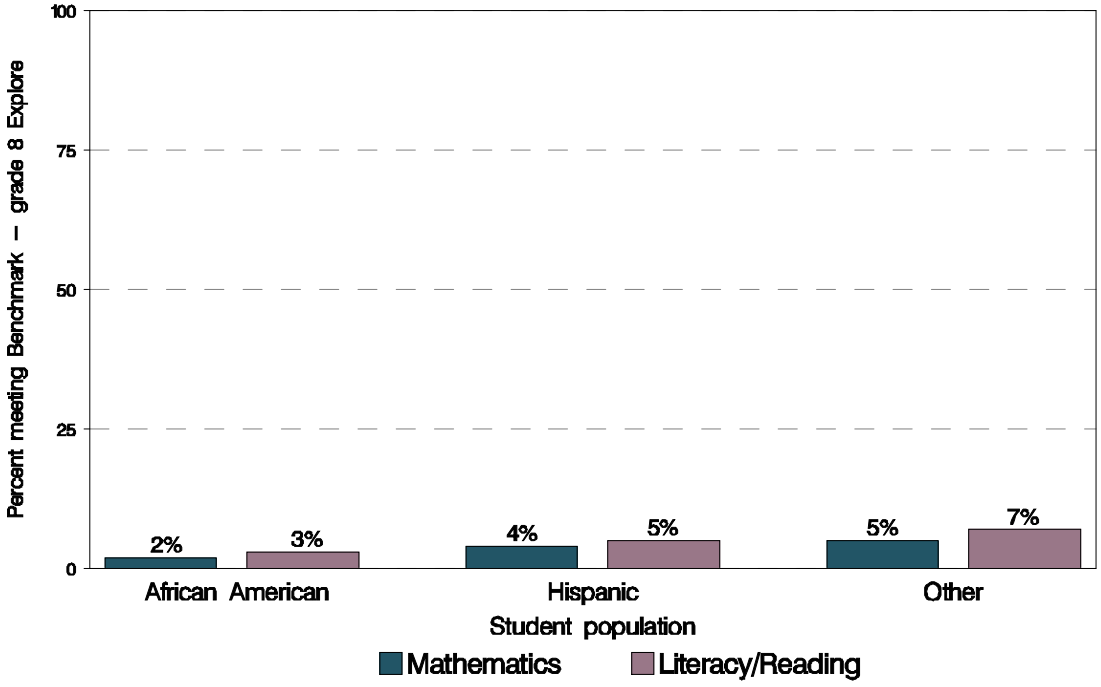

Figure 11. Percentage of Far Off Track fourth grade students getting On Track by the 8th grade ACT Explore, by student ethnic category.

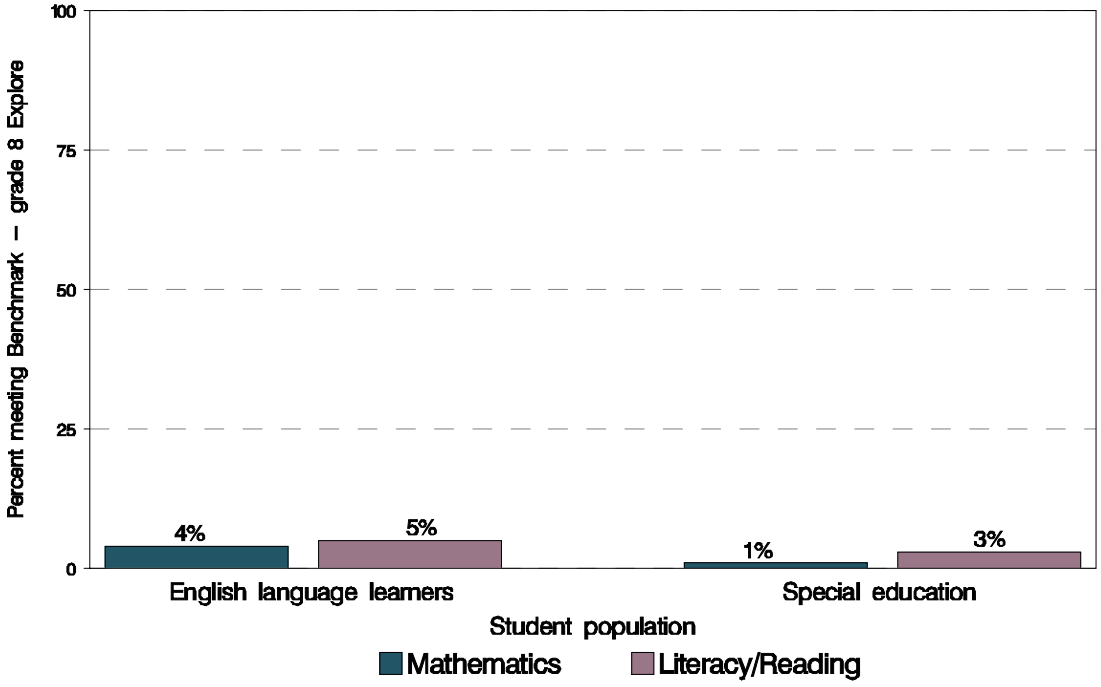

Figure 12. Percentage of Far Off Track fourth grade students getting On Track by the 8th grade ACT Explore, for English language learners and special education students.

How Much Growth Towards 8th Grade Benchmarks Did Far Off Track Students Achieve between Grades 4 and 8?

Using the growth categories in Table 9, we examined the percentage of Far Off Track students who either reached the Benchmark or moved up into the top half of the Off Track category, indicating that they were getting close to the Benchmark (Figures 13-16 on pages 34 and 35). (The "reached Benchmark" category in these charts reports the same statistics as in Figures 9-12.) The overall percentage of Far Off Track students in the top two growth categories was 12% in mathematics and 11% in literacy/reading (Figure 13).[28] For low-income students, the corresponding totals were 11% in mathematics and 9% in literacy/reading (Figure 14).

It is also useful to look at the percentage of Far Off Track students who remained Far Off Track, represented by the last bar segment in Figures 13-16. For low-income students, these percentages were 53% in mathematics and 70% in reading/literacy (Figure 14). As was the case in high school, African American and special education students were the most at-risk groups based on the percentage of students staying Far Off Track in grades 4-8: 57 and 77 percent of African American students remained Far Off Track in mathematics and reading/literacy, respectively (Figure 15), while the corresponding statistics for special education students were 71 and 78 percent (Figure 16).

[28] As noted earlier, rounding may cause totals in the charts to differ from 100% and subtotals to differ from those reported in the text. For example, in mathematics in Figure 13, 3.682% of students in the first category and 8.817% in the second category add up to 12.499% in the two categories combined.

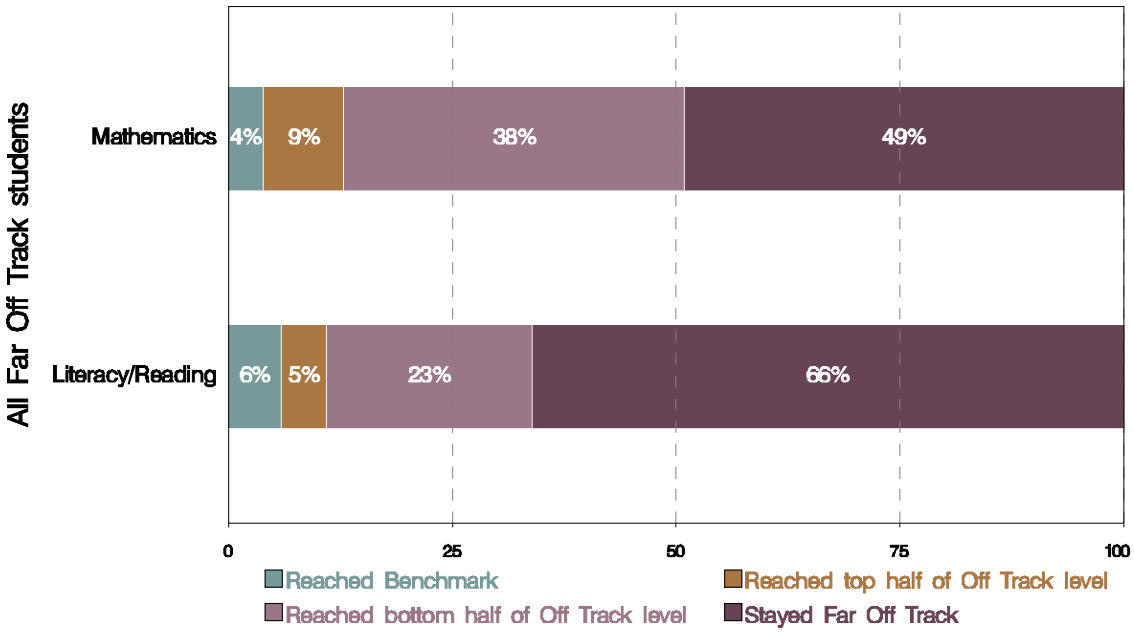

Figure 13. Percent of Arkansas Far Off Track students changing academic preparation levels between Grades 4 and 8, by subject.

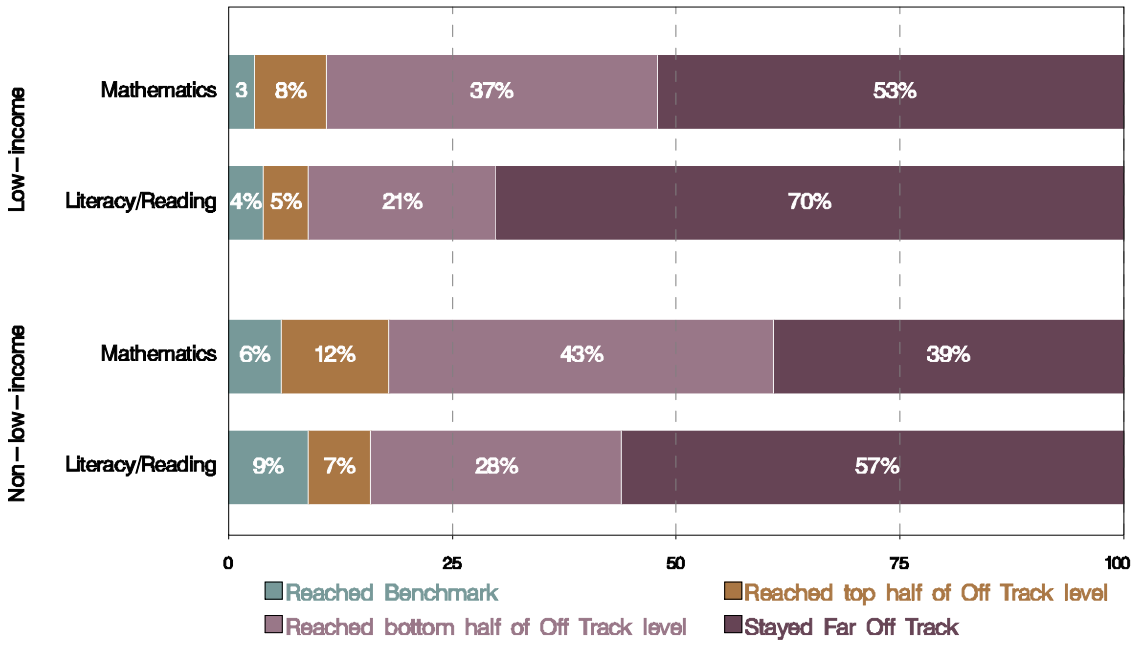

Figure 14. Percent of Arkansas Far Off Track students changing academic preparation levels between Grades 4 and 8, by subject and income.

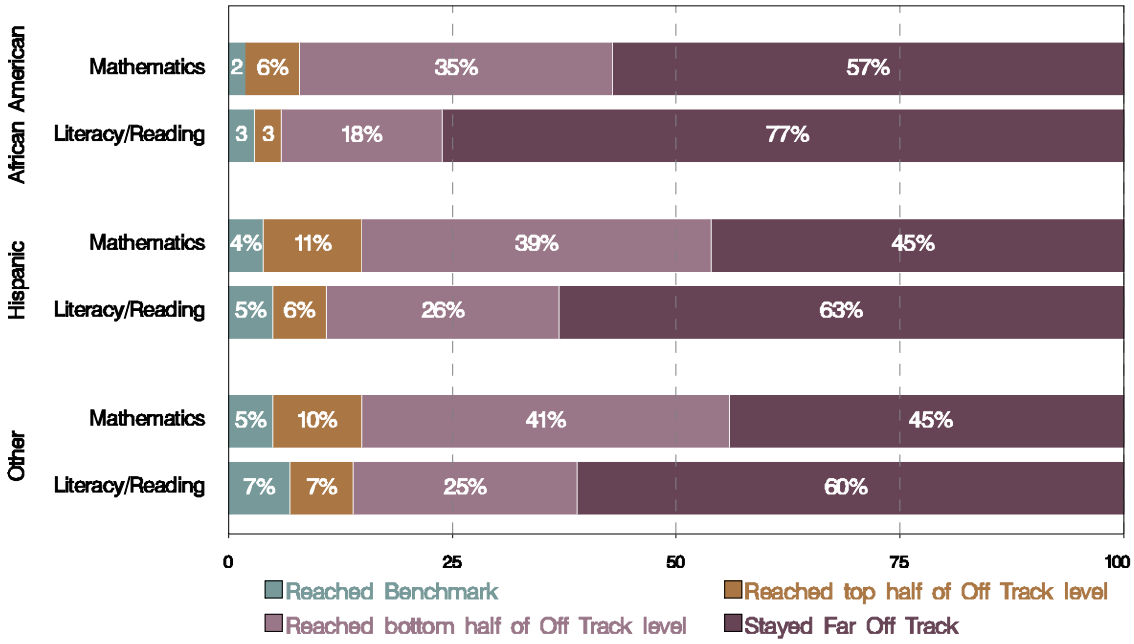

Figure 15. Percent of Arkansas Far Off Track students changing academic preparation levels between Grades 4 and 8, by subject and ethnicity.

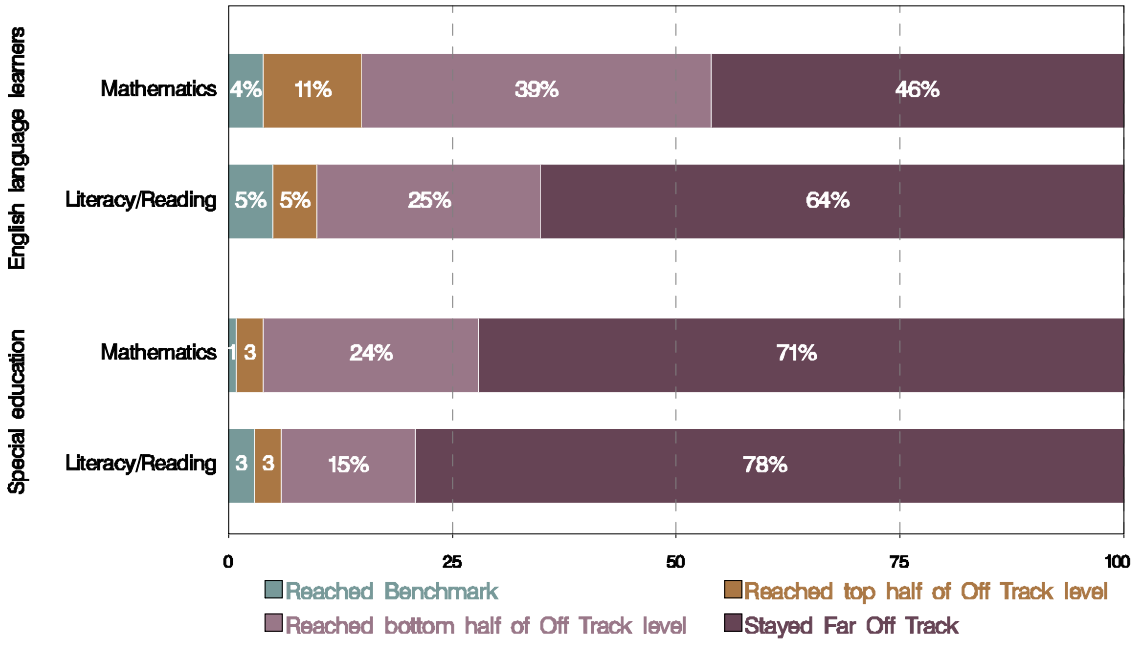

Figure 16. Percent of Arkansas Far Off Track English language learners and special education students changing academic preparation levels between Grades 4 and 8, by subject.

How Did Growth by Far Off Track Students in the Middle Grades Compare with Growth by Far Off Track Students in High School?

Growth comparisons between grades 4-8 and 8-11/12 can be difficult to make because of differences in selection effects between the two levels. These selection effects ought to favor growth by students in high school cohorts, as attrition is greater in high school.[29] Attrition is likely to remove a disproportionate share of less prepared and slower growing students, who are more likely to drop out, be retained in grade, and not take the ACT.

A second issue complicating comparisons between grades 4-8 and 8-11/12 is differences in the content alignment of the fourth grade ABE tests with eighth grade ACT Explore, compared with the alignment of ACT Explore with the ACT. Differences in content tested reduce the correlation between the results from earlier and later tests, increasing regression effects (Campbell & Kenny, 1999). Thus, lower alignment of the grades 4 and 8 tests would produce more "growth" between grades 4 and 8 for the students who are farthest off track, compared with the growth shown by similar students between grades 8 and 11/12 on more highly aligned tests. This effect is likely to work in the opposite direction from selection effects, favoring growth in the middle grades over high school.[30]

With these caveats, Tables 14 and 15 (on pages 38 and 39) compare the percentage of students from each group who made it into the top two performance levels by the end of the period (grade 8 for fourth graders or grades 11-12 for eighth graders), summarizing information

[29] The greater selectivity of the high school cohorts can be seen by comparing the size of the cohorts with total grade level enrollment in Tables 2 and 4. Also, in grade 8 the students in longitudinal cohorts did better relative to all tested students (Table 11 vs. Table 10) than was the case in grade 4 (Tables 13 vs. Table 12). These effects result in smaller groups of Far Off Track students in high school than in grades 4-8, as shown in Tables 14 and 15.

[30] Correlations between grade 4 ABE and grade 8 ACT Explore scores were slightly lower than between grade 8 ACT Explore and grades 11/12 ACT scores: the former correlations were .681 and .650 in mathematics and reading/literacy, respectively, versus .692 and .691 between grades 8 and 11/12.

from Figures 5-8 and 13-16. In addition, these tables provide information on how far below the On Track level each group of students started out on average, measured in standard deviation units. This information is shown in the columns labeled "average distance below Benchmark in grade 4 (or 8)."

In mathematics, the students in the grades 4-8 cohorts started out about the same distance behind as did students in the grades 8-11 or 8-12 cohorts, but in general were more successful at making it into the top two levels by the end of the cohort period. For example, low-income students in the grades 4-8 cohorts started out an average of 1.73 standard deviations below On Track performance levels in fourth grade; their counterparts in the grades 8-11 and 8-12 cohorts started out about 1.77 standard deviations behind (Table 14). Yet 11% of low-income students were able to transition into the top two performance levels in the middle grades, versus 4% in high school. This provides some evidence that it may be easier to catch students up in mathematics in the middle grades than in high school.

In reading, students caught up at higher rates in high school, but also didn't start out as far behind (Table 15). An ordinary least squares regression of z-score growth versus initial scores provides evidence that Arkansas Far Off Track students who were equally far behind in reading did more catching up in the middle grades than in high school.[31] However, differences in content alignment are likely to be an important issue affecting this comparison, as the fourth grade literacy test covers both reading and writing, while the ACT Explore and ACT reading tests only cover reading. Thus, further evidence is needed to determine whether catching students

[31] For example, a student who started out 1.5 standard deviations below the On Track level in fourth grade was predicted to move .57 standard deviations closer to the Benchmark between fourth and eighth grade, while a student in a similar position in eighth grade was predicted to move .47 standard deviations closer to the Benchmark between grade 8 and grade 11 or 12. Similar results obtained when score change per year was used as the metric to allow for the additional time to grow for students taking the ACT in grade 12.

up in reading is easier in the middle grades than in high school, and whether current efforts to remediate students in middle school are more effective than similar efforts in high school.

Table 14

Percentage of Arkansas Far Off Track Students Reaching the Top Two ***Mathematics*** *Performance Levels: Grades 4-8 versus Grades 8-12*

	Grades 4-8			Grades 8-11 and 8-12		
Category	Number of Far Off Track students	Average distance below benchmark in grade 4	Percent in top two growth categories	Number of Far Off Track students	Average distance below Benchmark in grade 8	Percent in top two growth categories
All students	17,626	-1.68	12%	3,664	-1.74	6%
Low-income	12,921	-1.73	11%	2,282	-1.77	4%
Non-low-income	4,705	-1.56	18%	1,382	-1.68	9%
African American	6,176	-1.81	8%	1,673	-1.81	2%
Hispanic	1,937	-1.71	15%	256	-1.64	7%
Other	9,513	-1.59	15%	1,735	-1.68	10%
English language learners	1,691	-1.76	15%	131	-1.71	5%
Special education	3,947	-2.02	5%	555	-2.08	3%

Table 15

*Percentage of Arkansas Far Off Track Students Reaching the Top Two **Reading** Performance Levels: Grades 4-8 versus Grades 8-12*

	Grades 4-8			Grades 8-11 and 8-12		
Category	Number of Far Off Track students	Average distance below benchmark in grade 4	Percent in top two growth categories	Number of Far Off Track students	Average distance below Benchmark in grade 8	Percent in top two growth categories
All students	21,559	-1.73	11%	6,269	-1.31	25%
Low-income	15,430	-1.78	9%	3,695	-1.33	20%
Non-low-income	6,129	-1.61	16%	2,574	-1.28	32%
African American	6,732	-1.82	5%	2,552	-1.35	16%
Hispanic	2,469	-1.81	11%	412	-1.31	16%
Other	12,358	-1.67	14%	3,305	-1.27	33%
English language learners	2,136	-1.85	11%	210	-1.34	11%
Special education	4,731	-2.21	6%	637	-1.43	14%

Conclusion

The results in this study on the difficulty of catching up Far Off Track students are consistent with previous research findings (Sawyer, 2008; ACT, 2008, 2012a; Dougherty, 2010;

Dougherty & Fleming, 2012; Sawyer & Gibson, 2012). This study extends those findings to demographic subgroups such as low-income students, African Americans, Hispanics, English language learners, and special education students. When more states provide the necessary data, research on students catching up by demographic subgroups in those states will be possible.[32]

These results support a general finding that it is difficult for students who are far behind to get on track in middle or high school. While overestimating the difficulty of catching up might encourage educators and policymakers to give up on students, underestimating the difficulty might lead educators to choose strategies and interventions that are too little and too late. For their part, policymakers who think that catching students up is easier than it actually is may reduce funding for educational programs. They may also hold schools to accountability targets that are not attainable over the period in question, creating strong incentives for leaders at various levels in the system to seek to artificially inflate test scores.

The high percentage of students who are below college and career readiness achievement targets at all grade levels—and the difficulty of catching them up—should also lead educators and policymakers to focus on early learning and to emphasize prevention over remediation (ACT, 2012a). These prevention strategies may include: changing the regular academic program to give every student access to a content- and vocabulary-rich curriculum beginning in the early years (Willingham, 2009; Common Core State Standards Initiative, 2010; ACT, 2012c; Dougherty, 2013); strengthening the early reading and mathematics program in preschool through third grade; and implementing programs and strategies that improve students' attendance and academic behaviors (Diamond, Barnett, Thomas, & Munro, 2007a, 2007b; Durlak,

[32] For example, the Kentucky Department of Education provided similar data, making possible a research report on students catching up in that state (Dougherty, Hiserote, & Shaw, 2013, in press). Dougherty & Fleming (2012) examined the percentages of Far Off Track students who caught up in four multi-state student cohorts in grades 8-12 and two statewide Arkansas cohorts (2005-2009 and 2006-2010) in grades 4-8.

Weissberg, Dymnicki, Taylor, & Schellinger, 2011; Sawyer & Gibson, 2012). Efforts to close academic preparation gaps should begin as early as possible, be more intensive, and take as long as necessary. Even if starting earlier does not reduce the amount of time it takes for students to catch up, starting earlier gives them more time to catch up.

In addition, a database might be developed to learn more about how effective various programs and interventions are at helping students catch up—from how far behind and over what length of time (Dougherty, 2010). Key components of the database would include information on how far behind the students are at different points in time and the nature, length, and intensity of the interventions they receive. From this, it might be possible to identify combinations of curriculum, interventions, and time requirements that are sufficient to enable most off-track students to succeed.

These findings should also affect the requirements that accountability systems place on schools. For example, reasonable growth goals might be set based on student performance in more successful schools (ACT, 2009, 2012d), and goals for percentages of students reaching college and career readiness should take into account the students' starting points and the number of years the school has available to catch them up, as is done in value-added models. In general, policy and practice should be informed by data on the success of real students in actual schools.

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Appendix A

Narrowing of Scale Score Gaps in Grades 8-12

Narrowing of Scale Score Gaps in Grades 8-12

Because the ACT Explore and ACT tests are scored on a common scale, growth between those two tests can be measured in scale score points. Accordingly, we disaggregated students in the longitudinal grades 8-11 and 8-12 cohorts into the scale score categories described in Table 8. Figure A1 (on page 50) shows the percent of Far Off Track students in the four Arkansas cohorts falling into each of these categories. Figures A2, A3, and A4 (on pages 50-51) provide the same information for student demographic groups based on income, ethnicity, English language learner, and special education status. (The "Reached Benchmark" category in these charts shows the same statistics as in Figures 1-4.)

As can be seen from these charts, the majority of Far Off Track students from every student group did not narrow their ACT Explore scale score gaps on the ACT. For example, 69% of low-income students did not narrow their scale score gaps in mathematics (Figure A2). The percentage of Far Off Track students in the first two scale score growth categories (reaching the Benchmark or closing their scale score gaps by half or more) was 9% in mathematics, 21% in reading, and 18% in science (Figure A1). For low-income students, the corresponding totals were 7% in mathematics, 16% in reading, and 14% in science (Figure A2).[33] These results are broadly similar to those from the z-score analysis.[34] All of this could indicate the presence of Matthew effects and the lack of sufficiently intensive and comprehensive interventions for these students in high school.

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[33] Totals on the charts may differ from 100% and subtotals on the charts from those reported in the text, due to rounding.

[34] Apparent discrepancies between the results from the z-score analysis in Figures 5-8 and those from the scale score analysis in Figures A1-A4 are generally based on differences in how far behind the students started out in eighth grade. For example, Far Off Track special education students started out an average of 7.3 scale score points (2.1 standard deviations) below the Benchmark in ACT Explore mathematics, versus 6.1 points (1.7 standard deviations) behind for all Far Off Track students. So even though a relatively high percentage of special education students (40%) narrowed their scale score gaps in mathematics between Explore and the ACT (Figure A4), most of those students did not narrow the gaps enough to get out of the Far Off Track group (Figure 8).

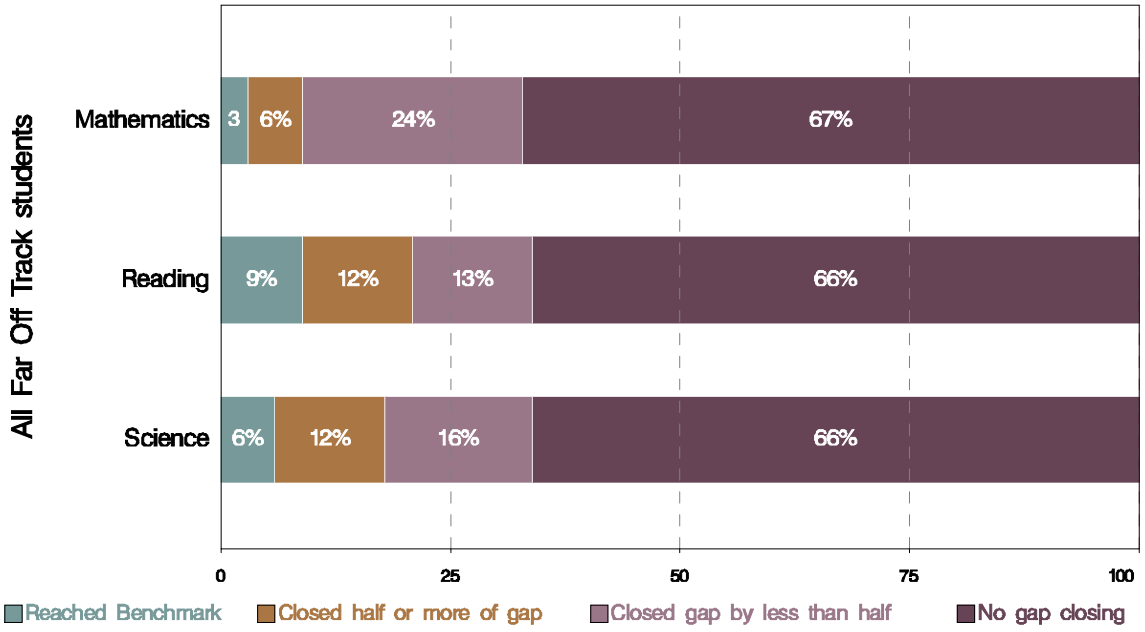

Figure A1. Percent of Arkansas Far Off Track students narrowing scale score gaps relative to the Benchmarks in grades 8-11 or 8-12, by subject.

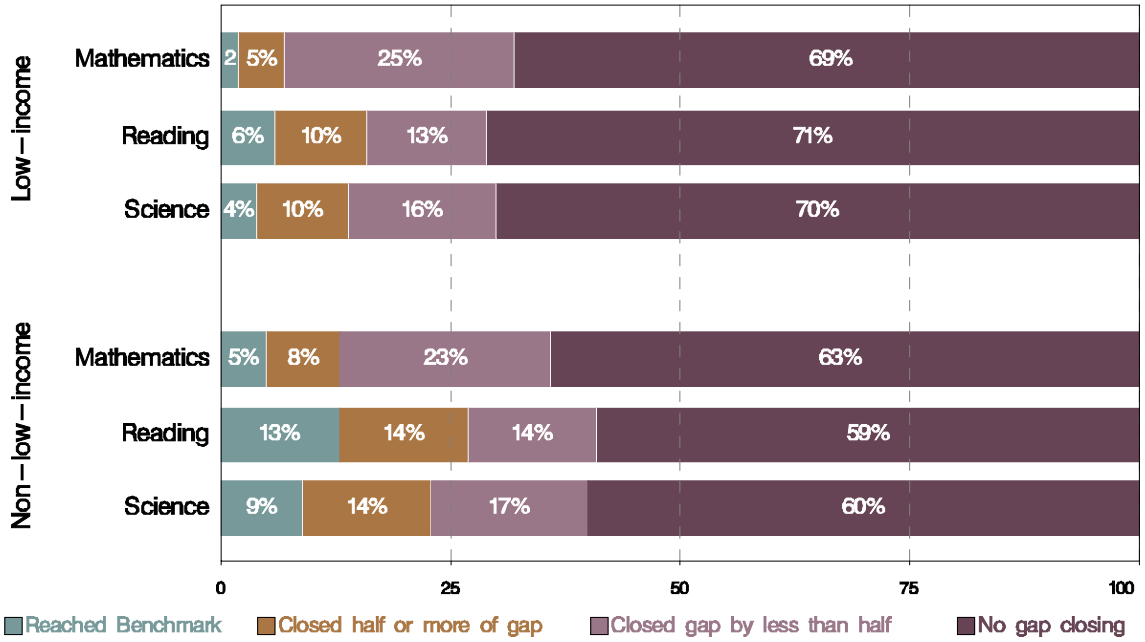

Figure A2. Percent of Arkansas Far Off Track students narrowing scale score gaps relative to the Benchmarks in grades 8-11 or 8-12, by subject and income.

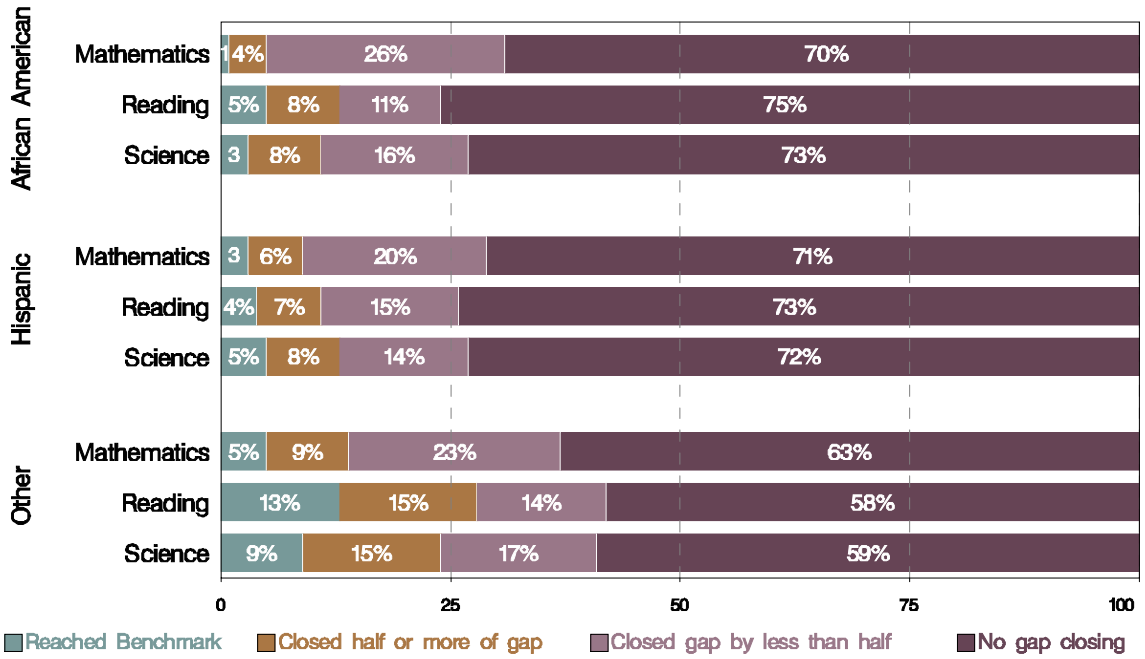

Figure A3. Percent of Arkansas Far Off Track students narrowing scale score gaps relative to the Benchmark in grades 8-11 or 8-12, by subject and ethnicity.

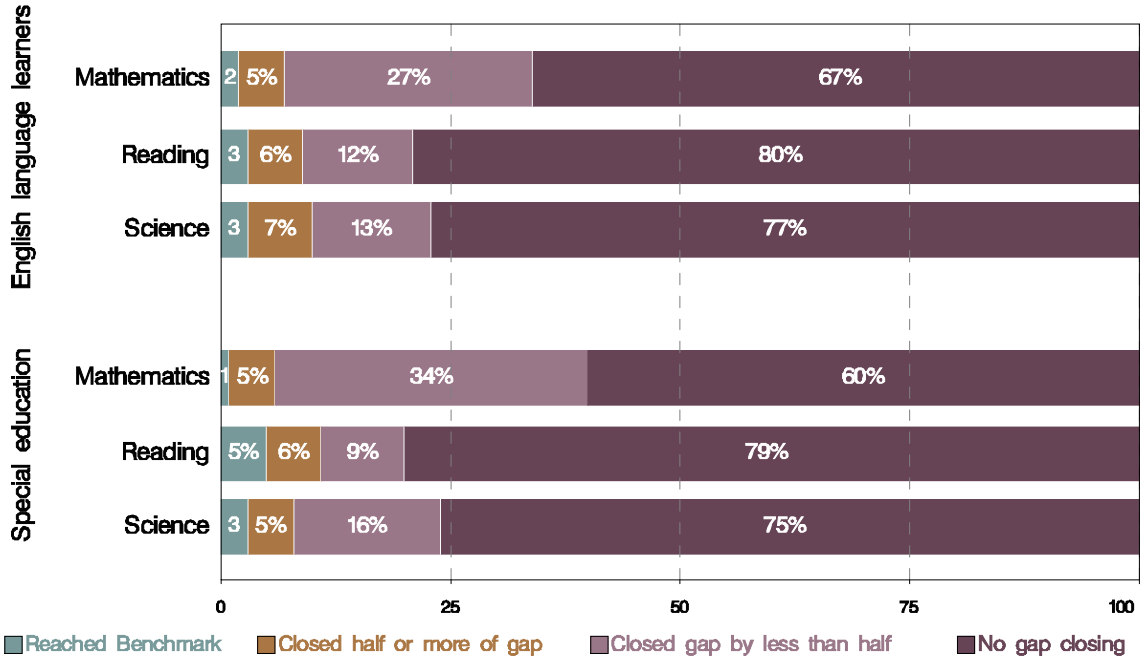

Figure A4. Percent of Arkansas Far Off Track English language learners and special education students narrowing scale score gaps relative to the Benchmark in grades 8-11 or 8-12.

Appendix B

Results by Income, Ethnicity, and Gender

Table B1

*Percentage of **All Arkansas ACT Explore Tested Students** Who Were Far Off Track in 8th Grade from 2006-07 and 2007-08 School Years*

Group	Income	Ethnicity	Gender	Number of students	Percentage of 8th graders who were Far Off Track		
					Mathematics	Reading	Science
9	Low-income	African American	Male	3,440	58.8%	76.5%	61.9%
10			Female	3,752	47.1%	62.0%	51.3%
11	Low-income	Hispanic	Male	1,074	41.4%	59.9%	43.1%
12			Female	1,070	37.9%	48.9%	37.9%
13	Low-income	Other	Male	5,230	36.5%	50.9%	41.5%
14			Female	5,375	29.4%	39.7%	33.8%
15	Non-low-income	African American	Male	1,015	49.3%	65.5%	51.9%
16			Female	1,054	34.6%	47.6%	37.8%
17	Non-low-income	Hispanic	Male	244	30.7%	45.9%	38.1%
18			Female	224	22.8%	34.8%	31.7%
19	Non-low-income	Other	Male	8,482	19.9%	31.8%	25.2%
20			Female	8,392	14.2%	22.2%	18.6%

Table B2

*Percentage of Arkansas Students **in Longitudinal Cohorts** Who Were Far Off Track in 8th Grade from 2006-07 and 2007-08 School Years: Students Disaggregated by Income, Ethnicity, and Gender*

					Percentage of 8th graders who were Far Off Track		
Group	Income	Ethnicity	Gender	Number of students	Mathematics	Reading	Science
9	Low-income	African American	Male	1,409	41.2%	65.6%	46.5%
10			Female	2,145	35.0%	52.5%	42.1%
11	Low-income	Hispanic	Male	387	25.8%	46.3%	30.0%
12			Female	485	26.0%	37.5%	27.6%
13	Low-income	Other	Male	1,779	16.9%	34.3%	22.8%
14			Female	2,534	16.7%	26.6%	21.7%
15	Non-low-income	African American	Male	478	35.6%	53.8%	42.3%
16			Female	620	27.7%	39.5%	30.0%
17	Non-low-income	Hispanic	Male	93	14.0%	26.9%	21.5%
18			Female	120	14.2%	21.7%	22.5%
19	Non-low-income	Other	Male	5,088	9.8%	21.1%	15.7%
20			Female	5,909	8.6%	16.0%	13.0%

Table B3

*Percent of Arkansas **Far Off Track** 8th Grade Students Meeting ACT College Readiness Benchmarks in Grades 11-12*

				Mathematics		Reading		Science	
Group	Income	Ethnicity	Gender	Number of Far Off Track students	Percent reaching benchmark	Number of Far Off Track students	Percent reaching benchmark	Number of Far Off Track students	Percent reaching benchmark
9	Low-income	African American	Male	581	1.4%	924	4.5%	655	4.1%
10			Female	750	0.9%	1,126	3.8%	902	1.1%
11	Low-income	Hispanic	Male	100	3.0%	179	5.0%	116	4.3%
12			Female	126	2.4%	182	2.7%	134	3.0%
13	Low-income	Other	Male	301	4.7%	610	10.3%	405	9.4%
14			Female	424	2.4%	674	9.2%	549	4.7%
15	Non-low-income	African American	Male	170	0.6%	257	8.6%	202	6.4%
16			Female	172	0.6%	245	8.2%	186	4.3%
17	Non-low-income	Hispanic	Male	13	15.4%	25	12.0%	20	25.0%
18			Female	17	0.0%	26	3.8%	27	7.4%
19	Non-low-income	Other	Male	499	7.8%	1,074	15.6%	797	13.4%
20			Female	511	5.1%	947	13.1%	771	6.4%

Table B4

*Percent of Arkansas Far Off Track Students in **Mathematics Scale Score Growth Categories** between Grades 8 and 11-12*

					Mathematics scale score growth category		
Group	Income	Ethnicity	Gender	Number of students	(1) - (2) Reached Benchmark or closed half or more of gap	(3) Closed gap by less than half	(4) No gap closing
9	Low-income	African American	Male	581	5.9%	31.7%	62.5%
10			Female	750	3.3%	20.8%	75.9%
11	Low-income	Hispanic	Male	100	8.0%	28.0%	64.0%
12			female	126	7.9%	13.5%	78.6%
13	Low-income	Other	Male	301	16.9%	26.6%	56.5%
14			Female	424	5.9%	23.3%	70.8%
15	Non-low-income	African American	Male	170	7.6%	27.1%	65.3%
16			Female	172	4.1%	24.4%	71.5%
17	Non-low-income	Hispanic	Male	13	23.1%	23.1%	53.8%
18			Female	17	11.8%	11.8%	76.5%
19	Non-low-income	Other	Male	499	20.0%	26.3%	53.7%
20			Female	511	11.9%	18.6%	69.5%

Table B5

*Percent of Arkansas Far Off Track Students in **Reading Scale Score Growth Categories** between Grades 8 and 11-12*

					Reading scale score growth category		
Group	Income	Ethnicity	Gender	Number of students	(1) - (2) Reached Benchmark or closed half or more of gap	(3) Closed gap by less than half	(4) No gap closing
9	Low-income	African American	Male	924	11.9%	11.1%	76.9%
10			Female	1,126	12.3%	10.8%	76.8%
11	Low-income	Hispanic	Male	179	12.3%	13.4%	74.3%
12			Female	182	8.2%	17.0%	74.7%
13	Low-income	Other	Male	610	23.6%	15.1%	61.3%
14			Female	674	25.4%	14.4%	60.2%
15	Non-low-income	African American	Male	257	17.5%	16.3%	66.1%
16			Female	245	18.4%	10.2%	71.4%
17	Non-low-income	Hispanic	Male	25	24.0%	8.0%	68.0%
18			Female	26	19.2%	19.2%	61.5%
19	Non-low-income	Other	Male	1,074	29.8%	14.1%	56.1%
20			Female	947	29.6%	14.7%	55.8%

Table B6

*Percent of Arkansas Far Off Track Students in **Science Scale Score Growth Categories** between Grades 8 and 11-12*

Group	Income	Ethnicity	Gender	Number of students	Science scale score growth category (1) - (2) Reached Benchmark or closed half or more of gap	(3) Closed gap by less than half	(4) No gap closing
9	Low-income	African American	Male	655	13.3%	16.6%	70.1%
10			Female	902	8.0%	14.6%	77.4%
11	Low-income	Hispanic	Male	116	14.7%	17.2%	68.1%
12			Female	134	9.0%	12.7%	78.4%
13	Low-income	Other	Male	405	23.2%	17.8%	59.0%
14			Female	549	18.4%	16.6%	65.0%
15	Non-low-income	African American	Male	202	16.8%	20.3%	62.9%
16			Female	186	15.6%	12.4%	72.0%
17	Non-low-income	Hispanic	Male	20	35.0%	15.0%	50.0%
18			Female	27	11.1%	11.1%	77.8%
19	Non-low-income	Other	Male	797	28.7%	17.8%	53.5%
20			Female	771	21.5%	16.5%	62.0%

Table B7

*Percent of Arkansas Far Off Track Students in **Mathematics z-Score Growth Categories** between Grades 8 and 11-12*

Group	Income	Ethnicity	Gender	Number of students	Mathematics z-score growth category (1) - (2) Reached or neared Benchmark level	(3) Reached bottom half of Off Track level	(4) Stayed Far Off Track
9	Low-income	African American	Male	581	2.6%	16.0%	81.4%
10			Female	750	1.9%	12.3%	85.9%
11	Low-income	Hispanic	Male	100	6.0%	24.0%	70.0%
12			Female	126	6.3%	21.4%	72.2%
13	Low-income	Other	Male	301	10.3%	26.2%	63.5%
14			Female	424	4.5%	26.7%	68.9%
15	Non-low-income	African American	Male	170	2.9%	20.0%	77.1%
16			Female	172	2.9%	17.4%	79.7%
17	Non-low-income	Hispanic	Male	13	23.1%	15.4%	61.5%
18			Female	17	11.8%	5.9%	82.4%
19	Non-low-income	Other	Male	499	13.8%	32.1%	54.1%
20			Female	511	9.0%	22.3%	68.7%

Table B8

*Percent of Arkansas Far Off Track Students in **Reading z-Score Growth Categories** between Grades 8 and 11-12*

Group	Income	Ethnicity	Gender	Number of students	Reading z-score growth category (1) - (2) Reached or neared Benchmark level	(3) Reached bottom half of Off Track level	(4) Stayed Far Off Track
9	Low-income	African American	Male	924	14.2%	25.4%	60.4%
10			Female	1,126	15.0%	26.9%	58.1%
11	Low-income	Hispanic	Male	179	16.2%	27.4%	56.4%
12			Female	182	12.1%	35.2%	52.7%
13	Low-income	Other	Male	610	29.2%	28.7%	42.1%
14			Female	674	30.1%	30.7%	39.2%
15	Non-low-income	African American	Male	257	20.6%	26.1%	53.3%
16			Female	245	22.0%	26.5%	51.4%
17	Non-low-income	Hispanic	Male	25	24.0%	24.0%	52.0%
18			Female	26	26.9%	19.2%	53.8%
19	Non-low-income	Other	Male	1,074	34.4%	27.7%	37.9%
20			Female	947	36.3%	29.0%	34.6%

Table B9

*Percent of Arkansas Far Off Track Students in **Science z-Score Growth Categories** between Grades 8 and 11-12*

Group	Income	Ethnicity	Gender	Number of students	Science z-score growth category (1) - (2) Reached or neared Benchmark level	(3) Reached bottom half of Off Track level	(4) Stayed Far Off Track
9	Low-income	African American	Male	655	9.8%	23.5%	66.7%
10			Female	902	6.8%	24.5%	68.7%
11	Low-income	Hispanic	Male	116	12.1%	30.2%	57.8%
12			Female	134	6.7%	27.6%	65.7%
13	Low-income	Other	Male	405	19.0%	31.9%	49.1%
14			Female	549	14.9%	32.4%	52.6%
15	Non-low-income	African American	Male	202	12.4%	26.7%	60.9%
16			Female	186	14.0%	23.1%	62.9%
17	Non-low-income	Hispanic	Male	20	35.0%	25.0%	40.0%
18			Female	27	11.1%	40.7%	48.1%
19	Non-low-income	Other	Male	797	25.8%	32.0%	42.2%
20			Female	771	19.6%	34.4%	46.0%

Table B10

*Percentage of **All Tested Arkansas Students** Who Were Far Off Track in 4th Grade from Students Taking Arkansas Benchmark Exams from2006-07 and 2007-08 School Years*

Group	Income	Ethnicity	Gender	Number of students	Percent of 4th graders who were Far Off Track	
					Mathematics	Literacy
9	Low-income	African American	Male	6,634	63.4%	73.4%
10			Female	6,711	58.5%	60.6%
11	Low-income	Hispanic	Male	2,534	47.9%	65.5%
12			Female	2,514	46.7%	53.9%
13	Low-income	Other	Male	11,451	38.4%	53.5%
14			Female	10,954	37.0%	39.5%
15	Non-low-income	African American	Male	1,081	47.6%	53.3%
16			Female	998	40.4%	38.0%
17	Non-low-income	Hispanic	Male	435	38.2%	52.9%
18			Female	406	40.8%	41.6%
19	Non-low-income	Other	Male	13,241	20.1%	31.2%
20			Female	12,575	18.7%	20.2%

Table B11

*Percentage of **Arkansas Students in Longitudinal Cohorts** Who Were Far Off Track in 4th Grade from Students Taking Arkansas Benchmark Exams from 2006-07 and 2007-08 School Years*

Group	Income	Ethnicity	Gender	Number of students	Percent of 4th graders who were Far Off Track	
					Mathematics	Literacy
9	Low-income	African American	Male	4,553	59.9%	69.8%
10			Female	4,948	55.9%	57.5%
11	Low-income	Hispanic	Male	1,919	43.6%	62.0%
12			Female	1,973	44.0%	51.5%
13	Low-income	Other	Male	8,325	34.0%	49.6%
14			Female	8,483	34.0%	36.5%
15	Non-low-income	African American	Male	797	45.5%	51.9%
16			Female	805	39.5%	37.1%
17	Non-low-income	Hispanic	Male	331	33.8%	48.3%
18			Female	311	38.3%	39.0%
19	Non-low-income	Other	Male	10,801	18.3%	29.2%
20			Female	10,535	17.3%	18.8%

Table B12

*Percentage of Arkansas **Far off Track** 4th Grade Students Meeting College Readiness Benchmarks on 8th Grade ACT Explore*

				Mathematics		Literacy/Reading	
Group	Income	Ethnicity	Gender	Number of Far Off Track students	Percent of Far Off Track students reaching Benchmark	Number of Far Off Track students	Percent of Far Off Track students reaching Benchmark
9	Low-income	African American	Male	2,727	2.2%	3,176	1.8%
10			Female	2,768	1.7%	2,843	3.1%
11	Low-income	Hispanic	Male	837	4.8%	1,183	4.3%
12			Female	869	3.6%	1,007	5.9%
13	Low-income	Other	Male	2,834	4.1%	4,125	5.5%
14			Female	2,886	3.3%	3,096	6.9%
15	Non-low-income	African American	Male	363	1.7%	414	4.3%
16			Female	318	3.8%	299	4.3%
17	Non-low-income	Hispanic	Male	112	2.7%	159	8.8%
18			Female	119	2.5%	120	5.8%
19	Non-low-income	Other	Male	1,973	6.5%	3,152	9.0%
20			Female	1,820	6.2%	1,985	9.6%

Table B13

*Arkansas Far Off Track 4th Grade Students - Percentage in **Mathematics z-Score Growth Categories** between Grades 4 and 8*

Group	Income	Ethnicity	Gender	Number of students	Mathematics z-score growth category (1) - (2) Reached or neared Benchmark level	(3) Reached bottom half of Off Track level	(4) Stayed Far Off Track
9	Low-income	African American	Male	2,727	6.9%	30.2%	62.9%
10			Female	2,768	8.1%	37.7%	54.2%
11	Low-income	Hispanic	Male	837	13.4%	36.6%	50.1%
12			Female	869	15.4%	42.6%	42.0%
13	Low-income	Other	Male	2,834	11.6%	33.6%	54.8%
14			Female	2,886	13.3%	42.8%	43.9%
15	Non-low-income	African American	Male	363	10.2%	36.6%	53.2%
16			Female	318	13.8%	42.5%	43.7%
17	Non-low-income	Hispanic	Male	112	19.6%	32.1%	48.2%
18			Female	119	19.3%	45.4%	35.3%
19	Non-low-income	Other	Male	1,973	17.2%	40.9%	41.9%
20			Female	1,820	20.1%	47.4%	32.5%

Table B14

*Arkansas Far Off Track 4th Grade Students - Percentage in **Literacy/Reading z-Score Growth Categories** between Grades 4 and 8*

					Literacy/reading z-score growth category		
Group	Income	Ethnicity	Gender	Number of students	(1) - (2) Reached or neared Benchmark level	(3) Reached bottom half of Off Track level	(4) Stayed Far Off Track
9	Low-income	African American	Male	3,176	3.6%	13.1%	83.3%
10			Female	2,843	6.8%	21.8%	71.4%
11	Low-income	Hispanic	Male	1,183	10.0%	21.3%	68.7%
12			Female	1,007	12.0%	30.4%	57.6%
13	Low-income	Other	Male	4,125	10.5%	21.0%	68.5%
14			Female	3,096	14.1%	26.1%	59.8%
15	Non-low-income	African American	Male	414	5.8%	17.6%	76.6%
16			Female	299	11.0%	29.1%	59.9%
17	Non-low-income	Hispanic	Male	159	14.5%	22.6%	62.9%
18			Female	120	10.0%	30.0%	60.0%
19	Non-low-income	Other	Male	3,152	15.9%	26.7%	57.4%
20			Female	1,985	18.9%	31.2%	49.9%

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