Crisis at the Core

Preparing All Students for College and Work



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Founded in 1959, ACT is an independent, not-for-profit organization that provides more than a hundred assessment, research, information, and program management services in the broad areas of education planning, career planning, and workforce development. Each year, we serve millions of people in high schools, colleges, professional associations, businesses, and government agencies—nationally and internationally. Though designed to meet a wide array of needs, all ACT programs and services have one guiding purpose—to help people achieve education and career goals by providing information for life's transitions.

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A Letter from the CEO of ACT



Far too many of the seniors in the class of 2004—both male and female and in all racial/ethnic groups—aren't ready for college or the workplace. And it seems unlikely that students already in the pipeline will be doing much better. Given the demands of today's global economy, this situation is nothing short of a crisis.

Fortunately, we can start addressing the problem right now. Results from the programs in ACT's Educational Planning and Assessment System show the clear relationship between the rigor of the high school coursework students take and their readiness for college and the workplace.

Simply put, the more rigorous and challenging those courses, the more likely it is students will be ready for college and will earn their degrees. Our research also confirms that taking and doing well in specific courses—such as Biology, Chemistry, Physics, and upper-level mathematics (beyond Algebra II)—has a startling effect on student performance and college readiness.

In view of the strong relationship between course-taking patterns and college readiness, we are recommending that every student take specific courses in high school. We're confident that, after reading this report, you will agree with us that we urgently need a more well-defined core curriculum. As a nation, we can't afford the costs of continuing to graduate high school students who are unprepared for postsecondary education and work.

To advance this goal, we will be partnering with a number of states in **Ready to Succeed,** a demonstration project that focuses on, among other things, course rigor. Selected school districts in each of our partner states will work with a team of specialists to evaluate the rigor of their courses, to identify the important rigorous skills that should be taught in these courses, and to measure improvements in student achievement. And we will soon unveil a number of other initiatives designed to enhance college readiness. Ultimately, we want to ensure that all students graduate from high school ready to enter college or work with a high probability of success.

But we can't do it alone. Educational leaders, policymakers, business and community leaders, and students themselves all have critical roles to play. We look forward to assisting in the important work of implementing these changes. Our nation's students deserve nothing less.

Sincerely,



Richard L. Ferguson
ACT Chief Executive Officer

Preface

What Is College Readiness?

College readiness should be an expectation not only for traditional college-bound high school students, but for all students at the high school level. It is important to ensure that all students are college ready—and especially important to address the substantial inequities in college readiness between male and female students and among students from various racial and ethnic backgrounds, geographical locales, types of schools, and family income levels (ACT, 2004).

What is college readiness? In this report we use the phrase to refer in a general sense to the level of preparation a student needs to be ready to enroll and succeed—without remediation—in a credit-bearing course at a two-year or four-year institution, trade school, or technical school. Increasingly, however, college readiness also means *workplace* readiness. While not every student plans to attend college after high school, many of the jobs now being created in a highly technology-based economy require abilities equivalent to those expected of the first-year college student. As Somerville and Yi (2002) point out: "Studies of the skill and knowledge that employers need in the workplace show with increasing clarity that their expectations look very much like those in higher education." The American Diploma Project (2004) echoes this finding: "No longer do students planning to go to work after high school need a different and less rigorous curriculum than those planning to go to college."

> *A more demanding secondary school curriculum will enable [some] students to enter the workforce immediately, if they choose to, confident that they have the skills and knowledge needed on the job and, increasingly, in their employer's classrooms. They also will be better equipped to attend college later or enroll in specialized training as their careers develop. It perhaps also needs to be added that as more students receive the preparation they need to continue education right out of high school, the more likely they are to enroll immediately in college or other postsecondary courses.*
>
> — National Commission on the High School Senior Year, 2001

Improving college readiness is crucial to the development of a diverse and talented labor force that is able to maintain and increase U.S. economic competitiveness throughout the world. In light of America's changing demographics, special emphasis must be placed on preparing women and minorities in greater numbers for the kinds of highly skilled scientific and technological careers necessary in today's global economy. "The consequence of this new economy, compounded by national demographic changes, is that workforce requirements and civic responsibilities combine to demand ever-increasing, individual knowledge and skills" (Callan and Finney, 2003).

- *70 percent of the 30 fastest-growing jobs will require an education beyond high school.*
- *40 percent of all new jobs will require at least an associate's degree.*

— Somerville and Yi, 2002

And, in addition to providing a stronger workforce for our nation, improved college readiness will provide a better and more rewarding quality of life for our citizens. Haycock (2003) says: "Just as we educators have learned that courses like Algebra II are the gatekeepers to higher education, we must now come to understand that they are gatekeepers to well-paying jobs, as well." Carnevale and Desrochers (2003) extend the notion of quality of life to include the life of the nation as a whole: "Educators have cultural and political missions to ensure there is an educated citizenry to continue to defend and promote America's democratic ideals."

In 1950, 80 percent of jobs were classified as "unskilled." Now, an estimated 85 percent of jobs are classified as "skilled," requiring education beyond high school. At the same time, 60 percent of future jobs will require training that only 20 percent of today's workers possess.

— Business–Higher Education Forum, 2003

- *State residents holding college degrees are the basis of a state's "educational capital."*
- *High levels of educational capital provide the foundation of a state's economic development and the preferred quality of life for its residents.*
- *An educated population earns higher incomes, makes fewer demands on social services, makes more informed health and lifestyle choices, and is more comfortable handling decisions about personal finance and retirement.*

— The National Center for Public Policy and Higher Education, 2004

To help our students become ready for college and the workplace, we must ensure that they prepare. Typically, such preparation consists of the courses students take in high school—which in turn assumes basic skills have been acquired in the years preceding high school. Certainly, the foundation for college and workplace readiness is the level of preparation that students bring with them as they make the transition from high school.

ACT research confirms the results and benefits of a rigorous core preparation curriculum for all students, whether they plan to go on to college or to work after high school (ACT, 2004). However, our research has also led us to rethink whether the core curriculum—as traditionally defined in terms of numbers of courses—adequately prepares students for success after high school.

This document is directed at a diverse audience: educational leaders and policymakers at all levels involved with secondary and postsecondary education and business and community leaders concerned about the preparation of the next generation of workers. We hope that our report alerts you to vital new information about the students you serve and that the recommendations we offer will help you make the crucial decisions that affect the schools and students in your district, region, state, and the nation at large.

1

Our Students Are Not Ready

Most of America's high school students are not ready for either college or work. We've made virtually no progress in the last ten years helping them to become ready. And from everything we've seen, it's not going to get better any time soon.

The final report of the U.S. Department of Education's National Commission on the High School Senior Year (2001) puts it bluntly: "Although the high school diploma is a prerequisite for college admission and most jobs, students who earn one have no guarantee that they are prepared for college-level work or entry-level employment."

Too few students are ready for college-level coursework, based on ACT's national readiness indicators. A mere 26 percent of ACT-tested high school graduates met ACT's College Readiness Benchmark demonstrating their readiness for their first credit-bearing college course in Biology, based on the 2003–2004 results of the ACT Assessment (Figure 1). Just 40 percent are ready for their first course in college Algebra, and, while better, still only 68 percent are ready for college coursework in English Composition.

ACT College Readiness Benchmarks

The ACT College Readiness Benchmarks represent the level of achievement required for students to have a high probability of success (a 75 percent chance of earning a course grade of C or better, a 50 percent chance of earning a B or better) in such credit-bearing college courses as English Composition, Algebra, and Biology. The benchmarks correspond to ACT Assessment scores on the English, Mathematics, and Science tests, respectively.

Minority students are much less likely to be college ready. When broken down by race/ethnicity, the college readiness numbers are even more sobering. Native Americans and Hispanic Americans are only about half as likely as the total population to be ready for college Biology, and African Americans are about five times less likely to be ready (Figure 2). For college Algebra, the percentages of these groups meeting the benchmark were only slightly higher (Figure 3). And while Caucasians and Asian Americans met the ACT Benchmark for college English Composition in greater numbers than the total population, Native Americans, Hispanic Americans, and African Americans were about one and a half times less likely to meet this benchmark than the total population (Figure 4).

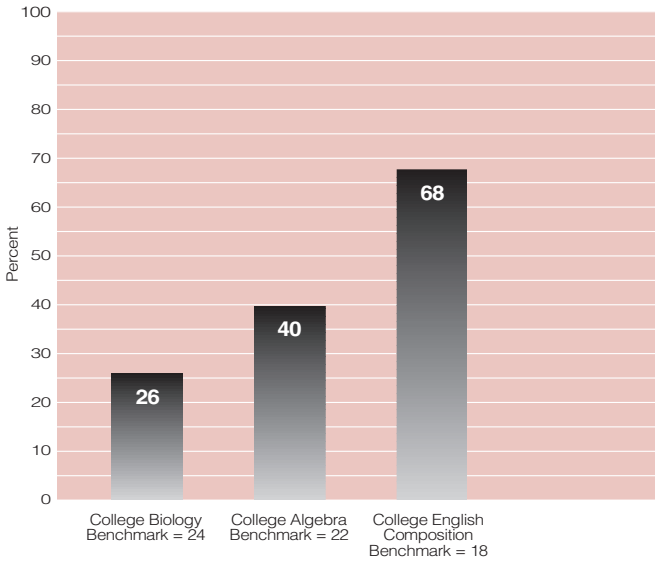


Figure 1: 2004 ACT-tested High School Graduates Meeting College Readiness Benchmarks

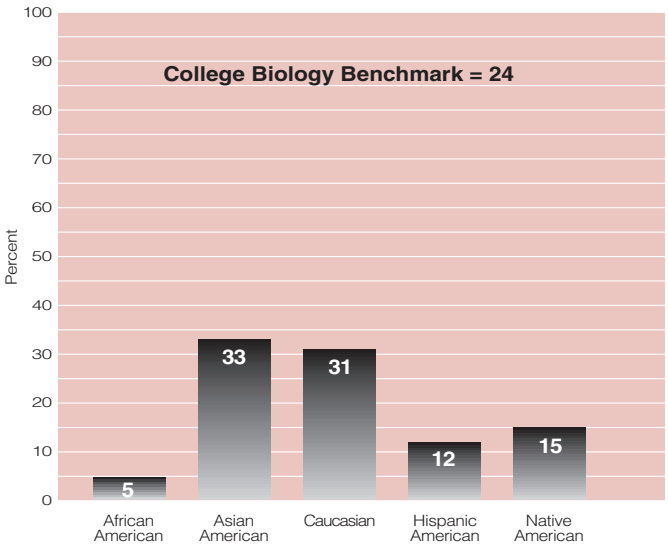


Figure 2: 2004 ACT-tested High School Graduates Meeting College Biology Benchmark by Race/Ethnicity

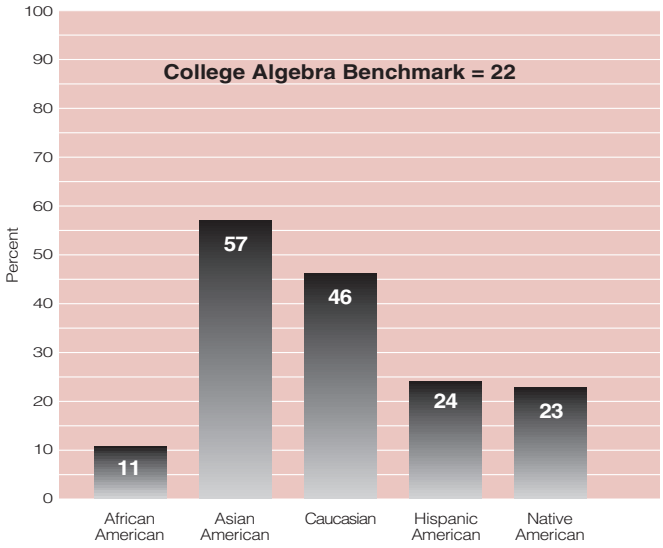


Figure 3: 2004 ACT-tested High School Graduates Meeting College Algebra Benchmark by Race/Ethnicity

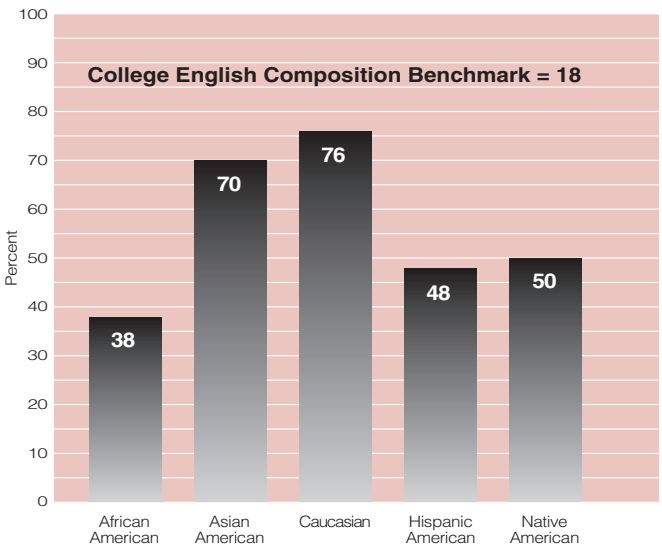


Figure 4: 2004 ACT-tested High School Graduates Meeting College English Composition Benchmark by Race/Ethnicity

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Note: The percentages expressed in the figures above and elsewhere in this report are percentages of all students who took a particular test.

Even fewer students are ready for college and work in all three academic areas—English, mathematics, and science. The percentage of ACT-tested high school graduates who met or exceeded all three College Readiness Benchmarks is alarming—a mere 22 percent of the 1.2 million students tested in 2004.

In spite of the increased focus on the quality of American education as reflected in enacted legislation and school reform efforts after the publication of *A Nation at Risk* in 1983, student performance at meeting the College Readiness Benchmarks has for the past decade remained stable or increased only slightly (Figure 5).

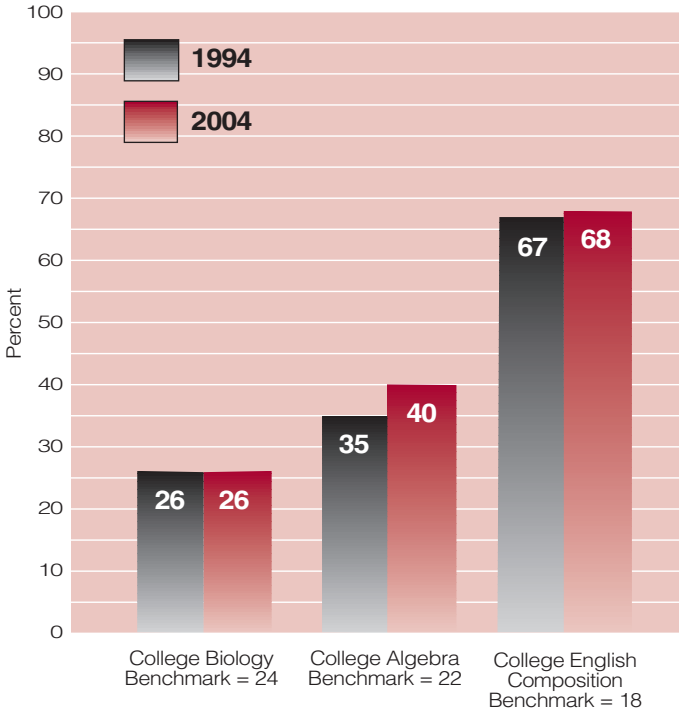


Figure 5: ACT-tested High School Graduates Meeting College Readiness Benchmarks (1994, 2004)

What are the consequences when students aren't ready for college-level work? In the past ten years, we have witnessed dramatic numbers of students enrolling in at least one remedial course in college. Nearly one-third of students entering some type of postsecondary education need to take remedial courses in one or more subjects because they lack the skills to take standard credit-bearing courses (Adelman, 1998). This figure balloons to 43 percent for students entering predominantly minority colleges. Research has also shown that students who required extensive remediation graduated from college at significantly lower rates (Mortenson, 1999). More than one-fourth of first-year students at four-year colleges and close to half of those in community colleges do not return for a second year (Gambiano, Denny, and Devore, 2000). These students end up unprepared for the future.

In Fall 2000, 63 percent of public 2-year institutions, 38 percent of public 4-year institutions, and 17 percent of private 4-year institutions reported that their students averaged a year or more of remedial coursetaking.

— National Center for Education Statistics, 2004

Student performance on the ACT Assessment has also remained stable or increased only slightly. The ACT Assessment composite score is another reliable indicator of college readiness due to its strong correlations with college GPA, college retention, and college graduation (Ziomek and Harmston, 2004). For the past five years, despite minor fluctuations and with a few encouraging exceptions (African Americans, Asian Americans), average composite scores on the ACT Assessment for males and females and for the five racial/ethnic groups also have remained stable or declined (Table 1).

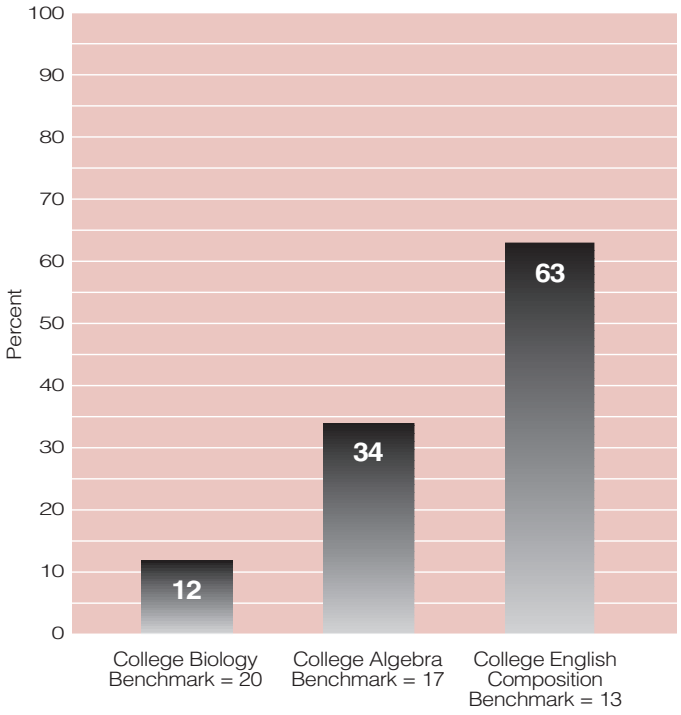


Figure 6: Eighth-Grade Students Meeting College Readiness Benchmarks Based on Nationwide EXPLORE Results (2004)

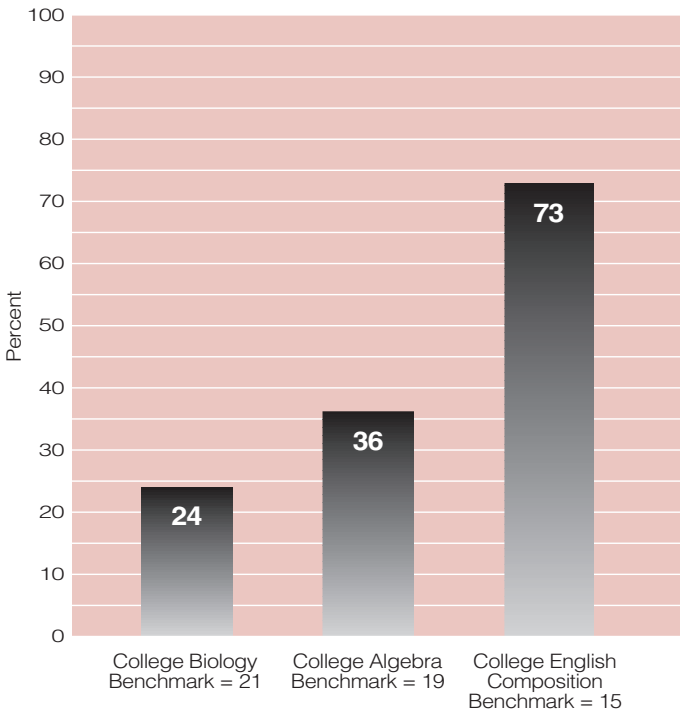


Figure 7: Tenth-Grade Students Meeting College Readiness Benchmarks Based on Nationwide PLAN Results (2004)

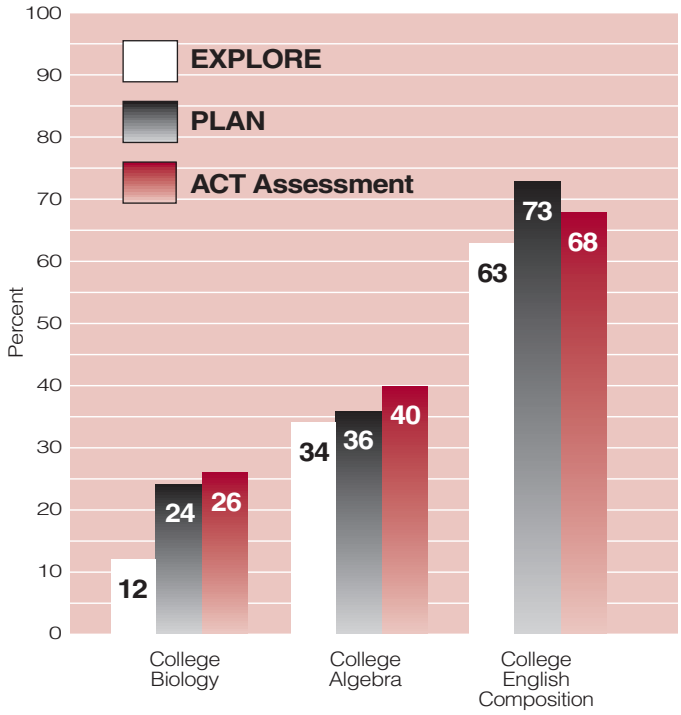


Figure 8: EXPLORE-, PLAN-, and ACT-tested Students Meeting College Readiness Benchmarks (2004)

Table 1

Average ACT Assessment Composite Scores for Total Group and by Gender and Race/Ethnicity (2000–2004)

Group	2000	2001	2002	2003	2004
Total	21.0	21.0	20.8	20.8	20.9
Female	20.9	20.9	20.7	20.8	20.9
Male	21.2	21.1	20.9	21.0	21.0
African American	17.0	16.9	16.8	16.9	17.1
Asian American	21.7	21.7	21.6	21.8	21.9
Caucasian	21.8	21.8	21.7	21.7	21.8
Hispanic American	18.9	18.8	18.4	18.5	18.5
Native American	19.0	18.8	18.6	18.7	18.8

The students currently at or near the end of the college preparation pipeline will be no more ready for college than the class of 2004. The percentages of eighth and tenth graders demonstrating likely readiness for college coursework in 2006 and 2008 are roughly similar to those of this year's graduates, based on results from ACT's early college readiness preparation system, EPAS (see Appendix for more details about EPAS). Using benchmarks adjusted for eighth and tenth grades, 12 percent of eighth graders are likely to be ready for college Biology, 34 percent for college Algebra, and 63 percent for college English Composition by the time they graduate from high school; the percentages of tenth graders likely to be ready for these courses by high school graduation are 24, 36, and 73, respectively (Figures 6 and 7). Although there are positive signs of increasing readiness between eighth and tenth grades in both English Composition and Biology, there is less progress being made in Algebra during the first two years of high school. This trend reverses between tenth and twelfth grade, wherein there is a slight increase in readiness for Biology and Algebra and a decrease in readiness for English Composition (Figure 8).

Though most students aspire to go on to some form of postsecondary education, they are not preparing for it. By eighth grade, most students indicate that they want to attend some form of postsecondary education (U.S. Department of Education, 2002; Venezia, Kirst, and Antonio, 2003). ACT takers from the class of 2004 reflect this reality in their intentions to earn a bachelor's degree or higher (Figure 9): Asian American, 83 percent; Caucasian, 80 percent; African American, 78 percent; Native American, 77 percent; Hispanic American, 75 percent. Yet we know that many will have trouble succeeding even in their first college course in Algebra, Biology, and English Composition. Thus, while students desire higher education, we have not prepared them to benefit from it. "Why? Not because they were incapable of mastering the skills essential to success in further education, but because they were not educated as if they were bound for college" (Haycock, 2003).

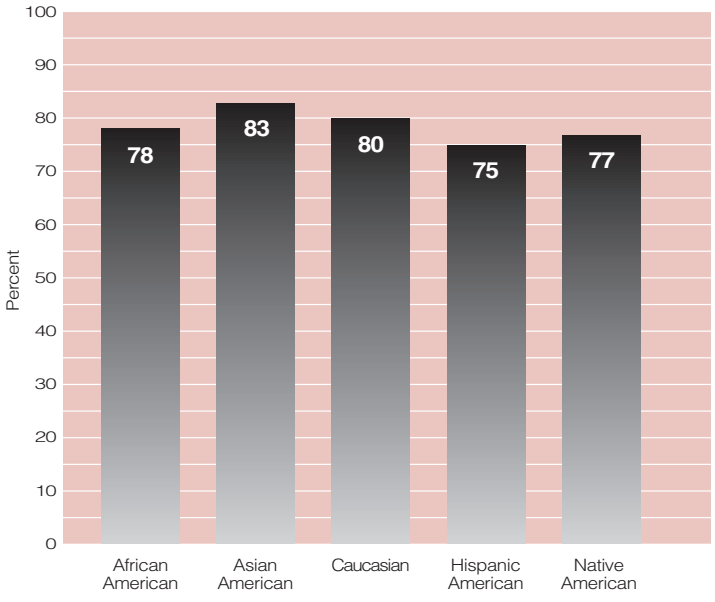


Figure 9: 2004 ACT-tested High School Graduates Reporting Intention to Pursue Bachelor's Degree or Higher by Race/Ethnicity

We are setting too many of our college-bound students up for disappointment. Furthermore, how many more students with equally high aspirations do not even enter the college preparation pipeline nor take college entrance tests due to financial barriers, lack of information about college options, misperceptions about college access, inadequate guidance counseling, or lack of support systems?

Summary

What can be done to remedy the situation? How can we help to ensure that more of our students are ready to make the most of the college experience they unequivocally desire? For nearly two decades ACT has recommended that all students take a minimum core college-preparatory curriculum, one that overlaps significantly with the "New Basics" recommended in *A Nation at Risk* in 1983: four years of English and three years each of mathematics, science, and social studies. But this may no longer be enough.

2

The Core Curriculum—No Longer a Ticket to College Success

For nearly two decades, we've recommended that, to be ready for college, students should take a specific minimum number of high school courses: four years of English and three years each of math, science, and social studies. But not enough students are taking this recommended core. And, we now know that simply taking core is not enough. It's the nature and the quality of the courses students take, not only the number, that determine if they will be ready for college and work.

Students who reported taking the minimum core curriculum score consistently higher on the ACT Assessment than those who reported taking less than core. Figure 10 shows one of the primary reasons that ACT has long championed the benefits of the core curriculum: its salutary effect on ACT Assessment performance. Higher scores translate into better access to educational opportunities, better grades in college, and higher levels of college persistence and graduation (Gambiano, Denny, and Devore, 2000).

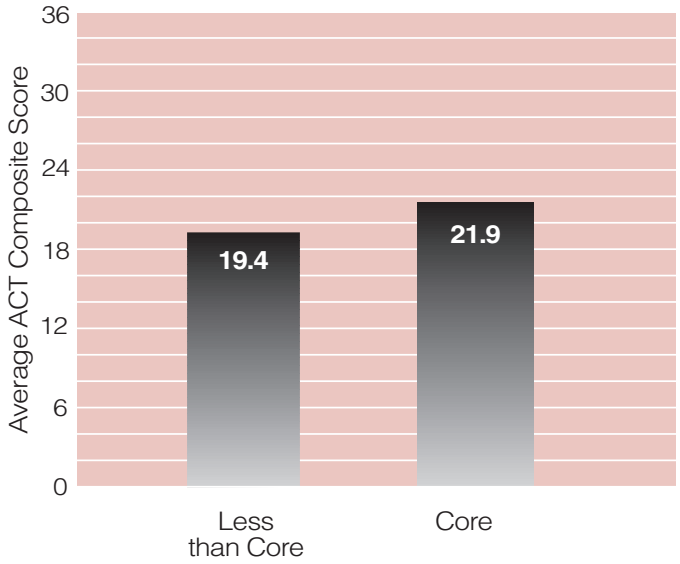


Figure 10: ACT Composite Scores for 2004 High School Graduates by Core Status



The benefits to students who take the minimum core curriculum also hold true for racial and ethnic groups. Figure 11 shows the 2004 ACT Assessment composite score results by race/ethnicity for students taking the core and those taking less than the core. In all racial and ethnic groups, those who take a core curriculum tend to score at least two score points higher on average on the ACT Assessment than do students who take less than the core. However, the relative impact of taking the core curriculum is not equal across racial and ethnic groups, a likely reflection of the huge inequities in course quality that exist in our nation's schools.

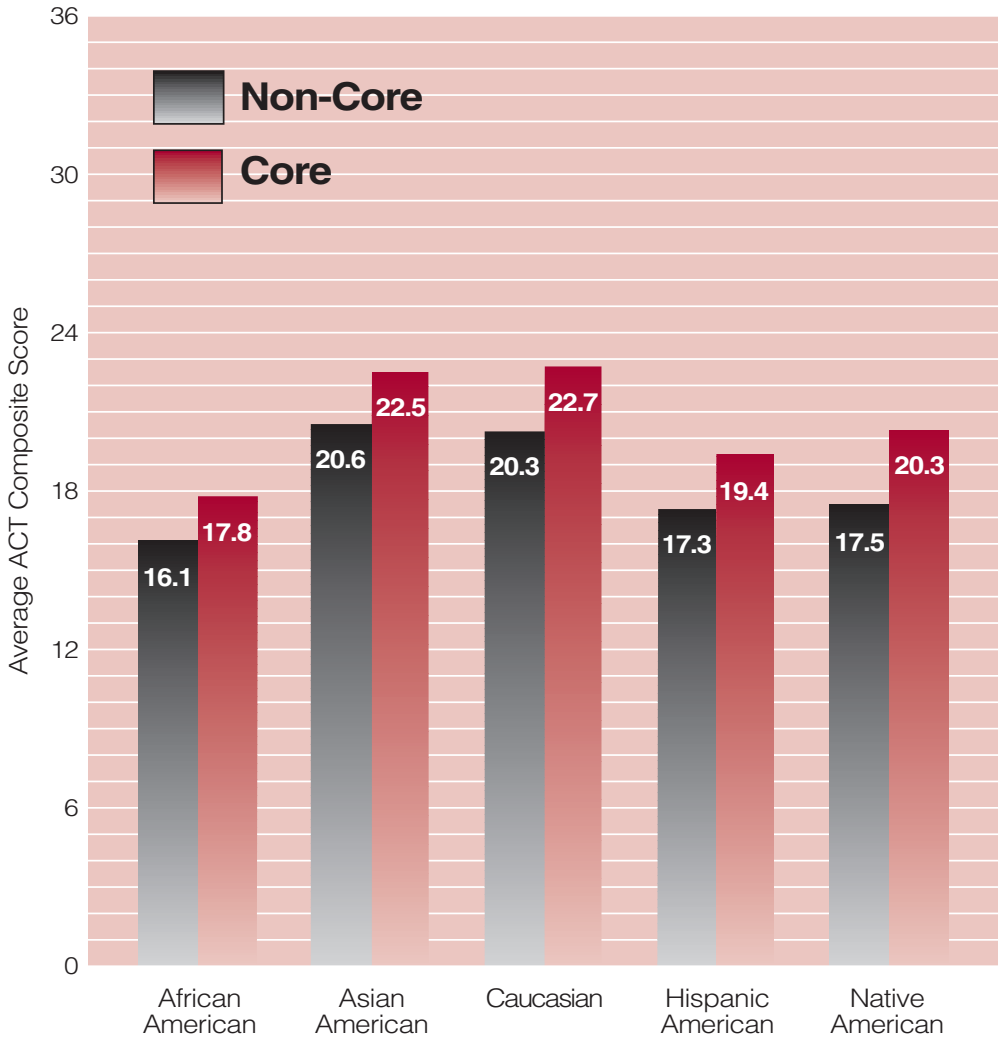


Figure 11: ACT Composite Scores for 2004 High School Graduates by Core Status and Race/Ethnicity

Taking a minimum core curriculum also has a positive effect on students' subject test scores. Figures 12, 13, 14, and 15 show the effects of taking the core on students' average 2004 scores on the ACT Assessment English, Mathematics, Reading, and Science Tests, respectively. In each instance, students who take less than core earn scores that are 2.1–2.8 points lower, on average, than the scores of students who take a core curriculum, thus diminishing their chances of being ready for college-level work.

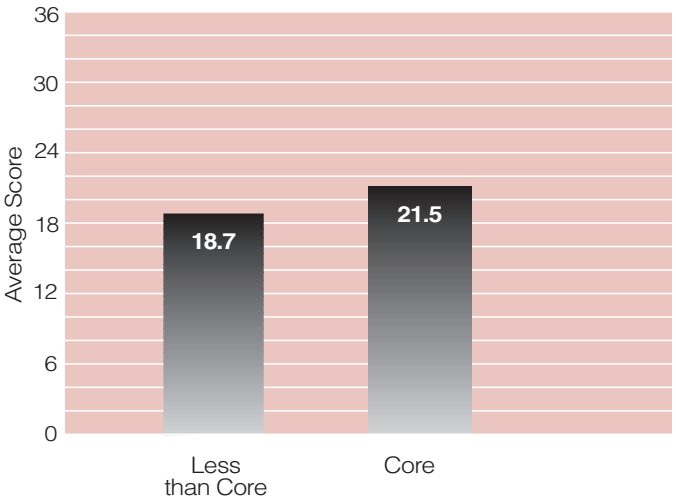


Figure 12: ACT English Test Scores for 2004 High School Graduates by Core Status

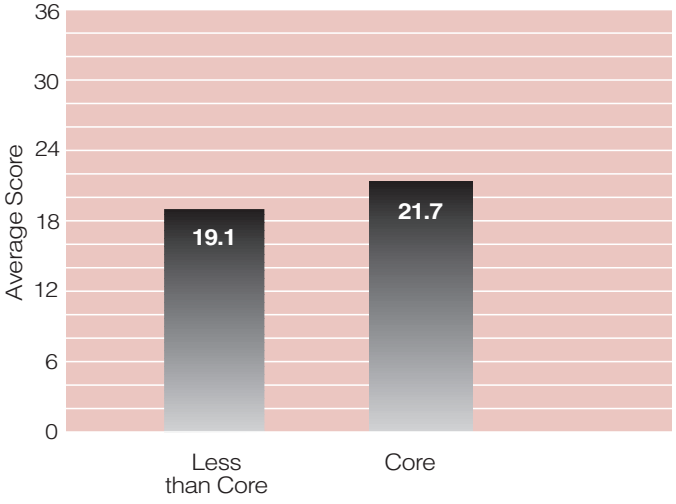


Figure 13: ACT Mathematics Test Scores for 2004 High School Graduates by Core Status

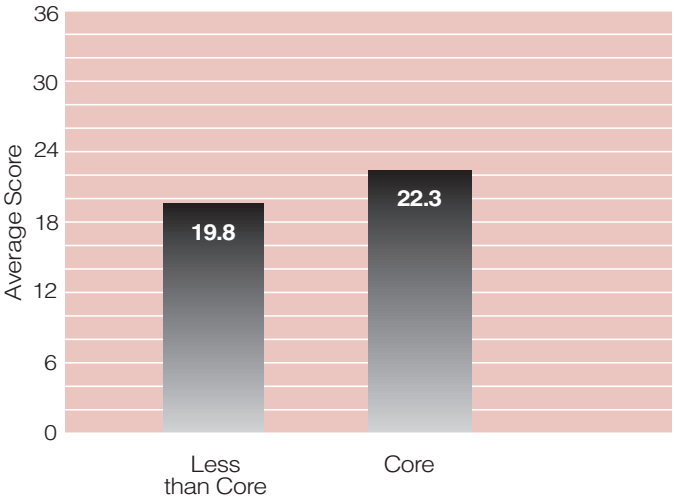


Figure 14: ACT Reading Test Scores for 2004 High School Graduates by Core Status

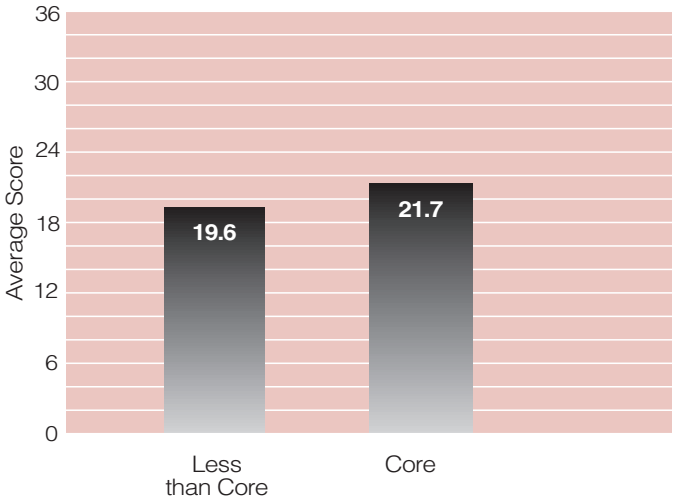


Figure 15: ACT Science Test Scores for 2004 High School Graduates by Core Status

Despite the long-recommended benefits of taking a core curriculum, not enough students take a core curriculum or are required to take it. Since 1994, the overall percentage of students taking a core curriculum has remained relatively stable, peaking at 61 percent in 2000 and declining slightly since then. Figure 16 shows, by gender and by race/ethnicity, the percentages of ACT-tested high school graduates who took the "4-3-3-3" curriculum—four years of English and three years each of math, science, and social studies—in 1994 and 2004.

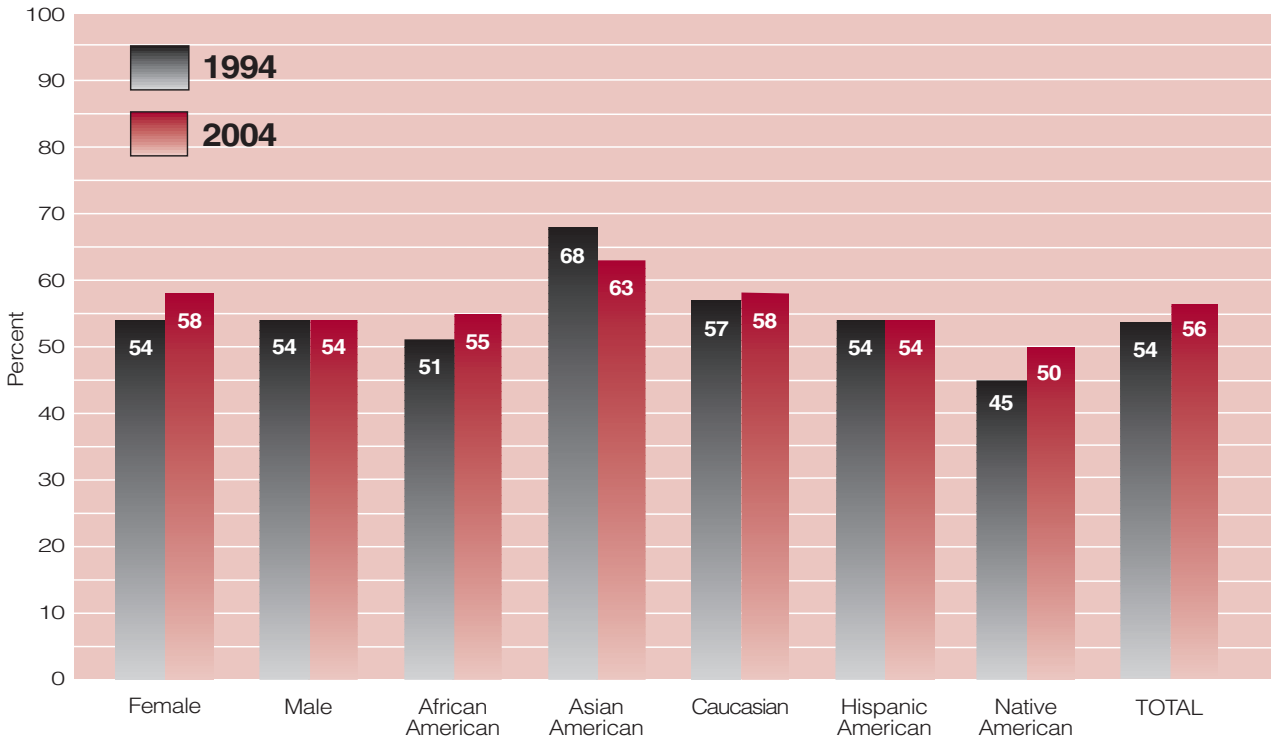


Figure 16: ACT-tested High School Graduates Taking Core Curriculum by Gender and Race/Ethnicity (1994, 2004)

Student intentions to complete a core curriculum are not changing. Figure 17 shows the intentions of those who were in eighth grade and tenth grade during 1994 and 2004 to complete a core curriculum before graduation. Students in eighth grade are largely unaware of the importance of taking a core curriculum. While this awareness increases by the tenth grade, it does not necessarily result in actual coursetaking behavior as measured by students who took the ACT Assessment. Comparing student awareness between 1994 and 2004 suggests that this trend has not changed in a decade.

Even if students take the minimum number of courses as defined by the core curriculum, it will not guarantee that they are college ready. While taking a core curriculum certainly helps students raise their level of academic preparation and meet high school graduation requirements, it does not necessarily mean that a student is ready for college-level work. Obviously, the rigor of these courses is a strong determiner in preparing students for college and work. "In most states, even students who follow all the rules in high school have no guarantee of meeting postsecondary education's course requirements" (Somerville and Yi, 2002). Somerville and Yi found very little consensus between K–12 and higher education systems as to the nature of the coursework students need in high school. Few states have reached agreement between K–12 and higher education, with more agreement on the number of courses than on the types of courses students should take.

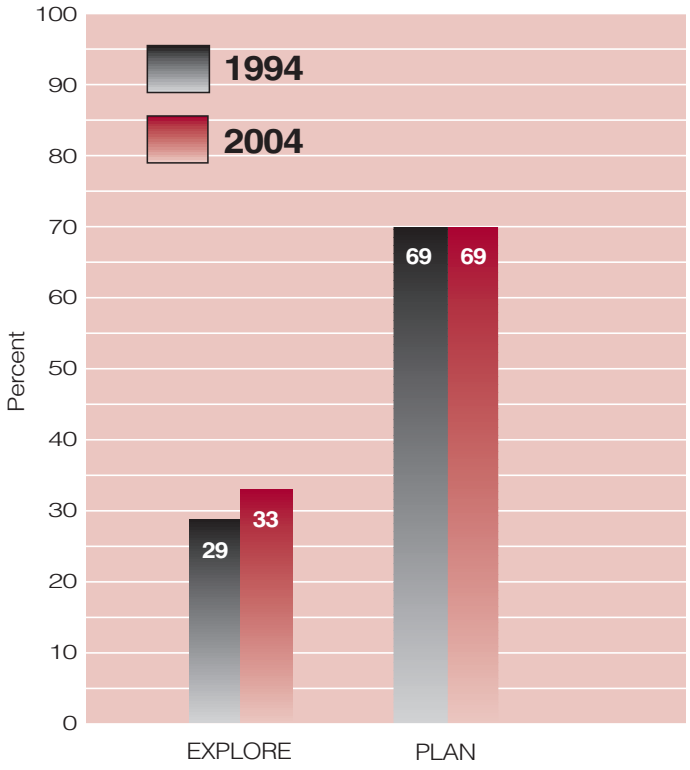


Figure 17: EXPLORE- and PLAN-tested Students Planning to Take Core Curriculum (1994, 2004)

More Than Core

ACT Assessment results show the benefits of taking the core curriculum over taking less than the core. But they also show the even greater benefits accrued by students who take *more* than the core curriculum.

Taking more than the four-year English core curriculum improves the probability that students will meet the ACT Benchmark for College English Composition. Figure 18 shows the percentages of 2004 high school graduates meeting this benchmark who took less than four years of English, four years, and four years plus a speech course. The percentage of students meeting the benchmark who took four years of English plus a speech course is three points higher than that of students who took only the four years (which in turn is 11 points higher than that of students taking less than four years of English).

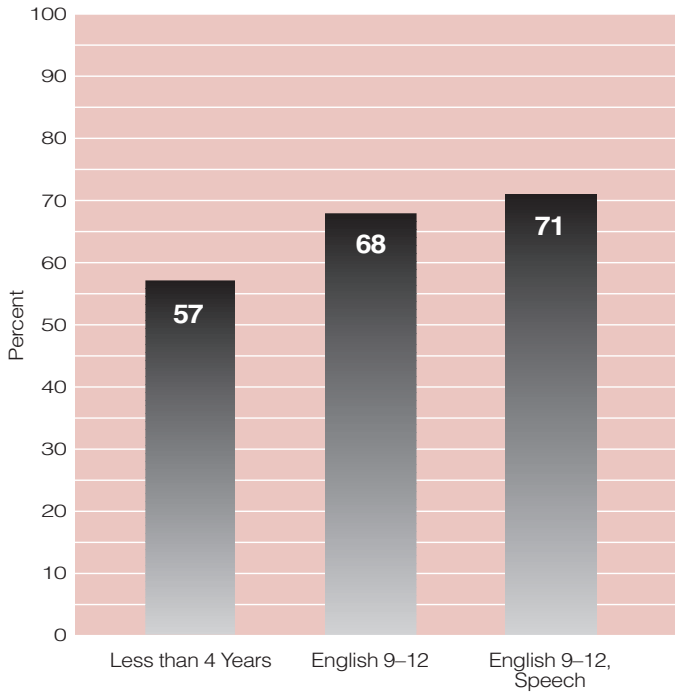


Figure 18: 2004 ACT-tested High School Graduates Meeting College English Composition Benchmark by English Course Sequence

Taking a speech course also improves students' scores on the ACT English Test. Figure 19 documents the difference in ACT Assessment English Test scores between students who took the four-year English core curriculum and students who took the same four years plus an additional speech course. The figure shows that the average ACT Assessment English Test score for students in the latter group is one-half point higher than the average score achieved by those who only took the core number of English courses.

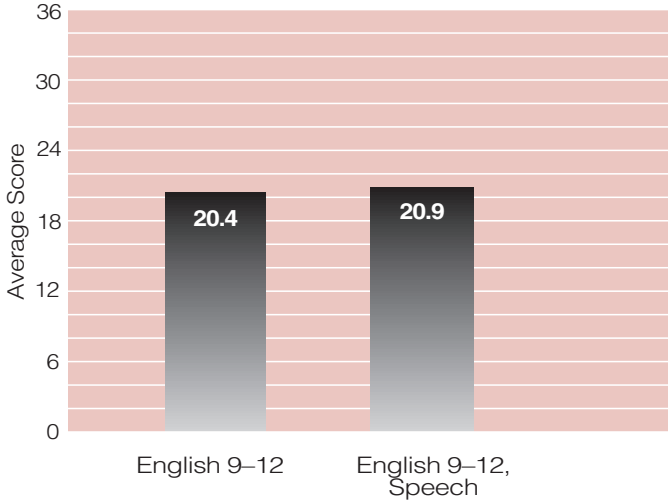


Figure 19: ACT English Test Scores for 2004 High School Graduates by English Course Sequence

This increase holds true for males and females and for almost all racial/ethnic groups. Almost every racial and ethnic group experiences a 0.4-point increase, while males and females each show a 0.5-point increase (Figure 20).



Taking rigorous coursework beyond the mathematics core greatly increases students' success at meeting the ACT Benchmark for College Algebra. Seventy-four percent of students who took Trigonometry and Calculus in addition to the three-course sequence Algebra I, Algebra II, and Geometry met the benchmark for college Algebra, as did 55 percent of students who took these three courses plus Trigonometry and one other upper-level mathematics course, and 37 percent of students who took the three courses plus Trigonometry (Figure 21). At 13 percent, students who took only Algebra I, Algebra II, and Geometry were no more successful at meeting the benchmark than were students who took less than these three years.

What percent of the 2004 class took Speech?

Only 33 percent of the 2004 ACT-tested high school graduates took a speech course in addition to the four-year English curriculum.

— ACT, 2004

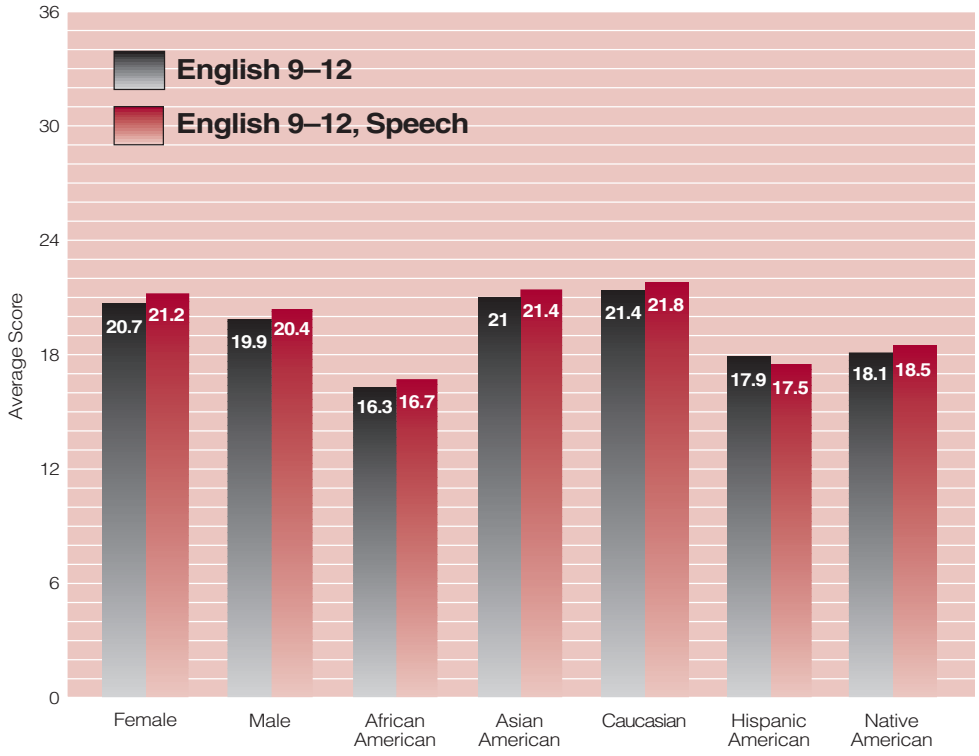


Figure 20: ACT English Test Scores for 2004 High School Graduates by English Course Sequence, Gender, and Race/Ethnicity

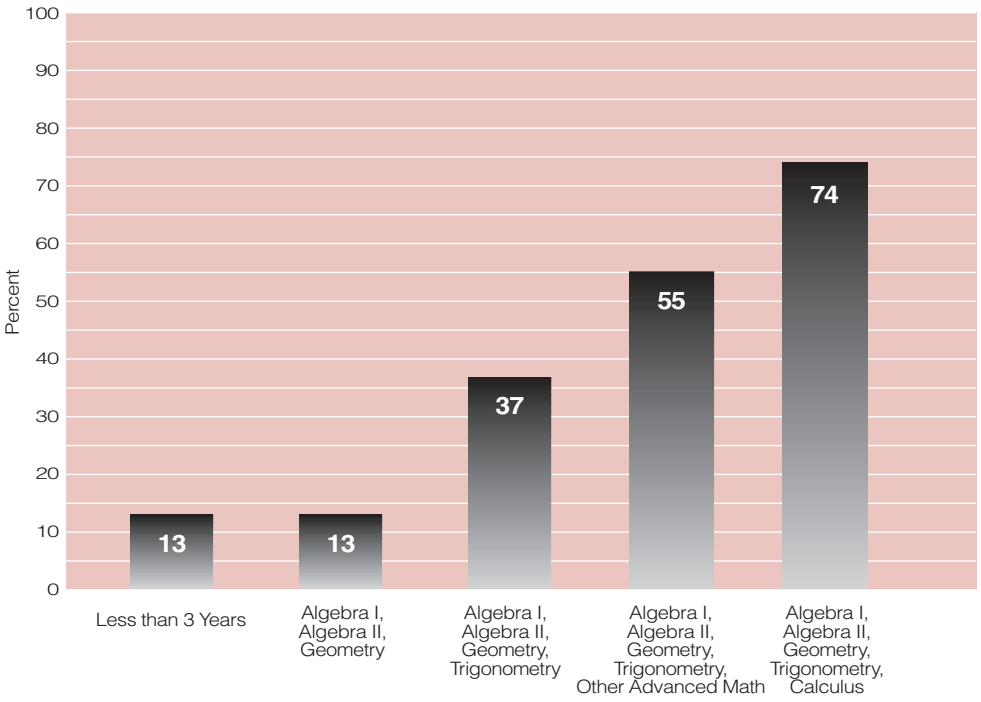


Figure 21: 2004 ACT-tested High School Graduates Meeting College Algebra Benchmark by Mathematics Course Sequence

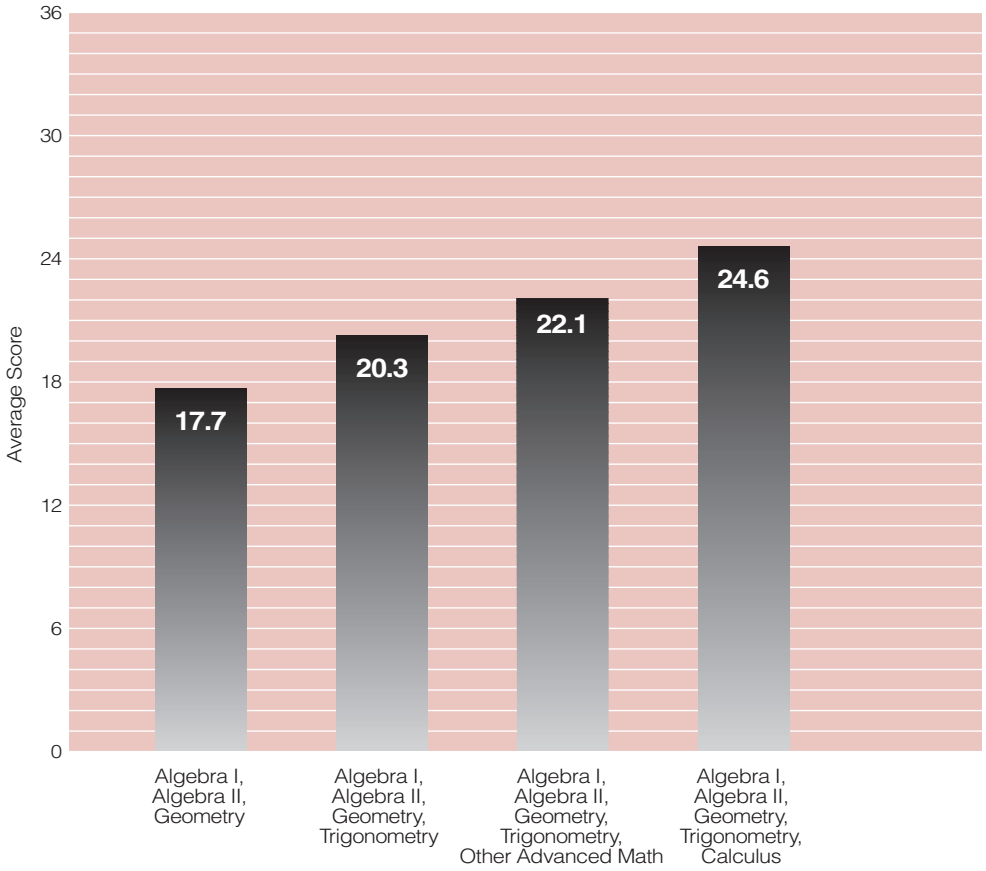


Figure 22: ACT Mathematics Test Scores for 2004 High School Graduates by Mathematics Course Sequence

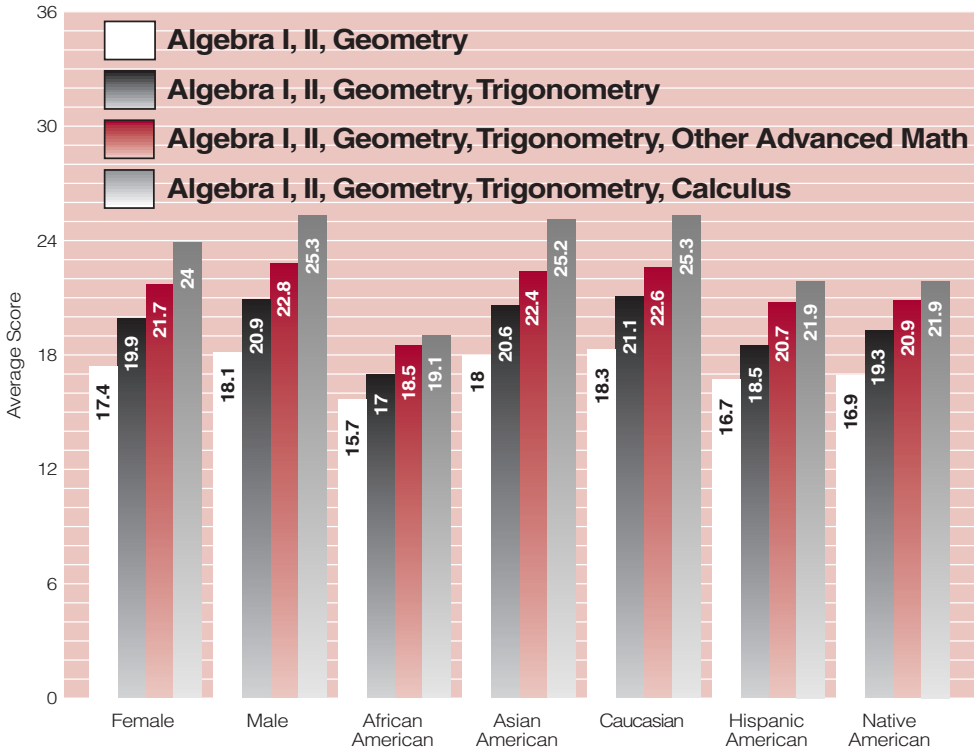


Figure 23: ACT Mathematics Test Scores for 2004 High School Graduates by Mathematics Course Sequence, Gender, and Race/Ethnicity

Taking advanced mathematics courses beyond Algebra II significantly improves students' average ACT Mathematics Test scores. In Mathematics, the benefits of taking more than the core curriculum of three courses are especially striking in that the benefits increase as students take more courses beyond a solid foundational core of Algebra I, Algebra II, and Geometry. Figure 22 shows the average ACT Mathematics Test scores for students who took three core mathematics courses of Algebra I, Algebra II, and Geometry, three courses plus Trigonometry, three courses plus Trigonometry and one other upper-level mathematics course (such as Advanced Mathematics or Statistics), and three courses plus Trigonometry and Calculus. The students taking the core plus Trigonometry outscored the core-curriculum takers by 2.6 points; the students taking core, Trigonometry, and an upper-level mathematics course outscored the core-takers by 4.4 points; and the students taking the core plus Trigonometry and Calculus outscored the core-takers by *6.9 points*. Increases associated with taking more advanced mathematics courses also hold true for both genders and for all racial/ethnic groups (Figure 23).

What percent of the 2004 class took rigorous math courses?

Only 4 out of 10 of the 2004 ACT-tested high school graduates took Trigonometry or other advanced mathematics courses beyond Algebra I, Algebra II, and Geometry. Fewer than 25 percent took a beginning Calculus course.

— ACT, 2004



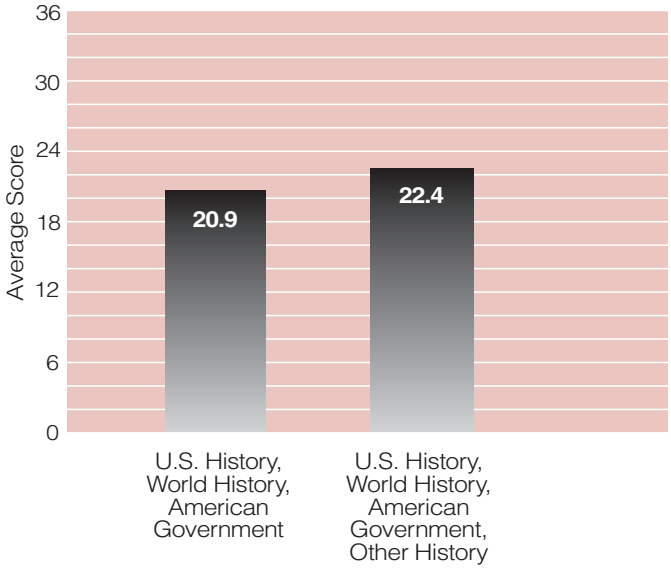


Figure 24: ACT Reading Test Scores for 2004 High School Graduates by Social Studies Course Sequence

Taking more social studies coursework increases students' ACT Reading Test scores. Strong reading skills are critical to college readiness and these skills should be reinforced in high school courses throughout the curriculum. The impact of social studies courses on reading achievement is clear. Many of the important critical reading skills are emphasized in social studies courses. Figure 24 shows the average ACT Assessment Reading Test scores of students who took the core social studies curriculum of three courses and those who took an additional history course beyond the core. The average score earned by the latter group is 1.5 points higher than that earned by core-takers. Again, the trend holds for both genders and all racial/ethnic groups (Figure 25).

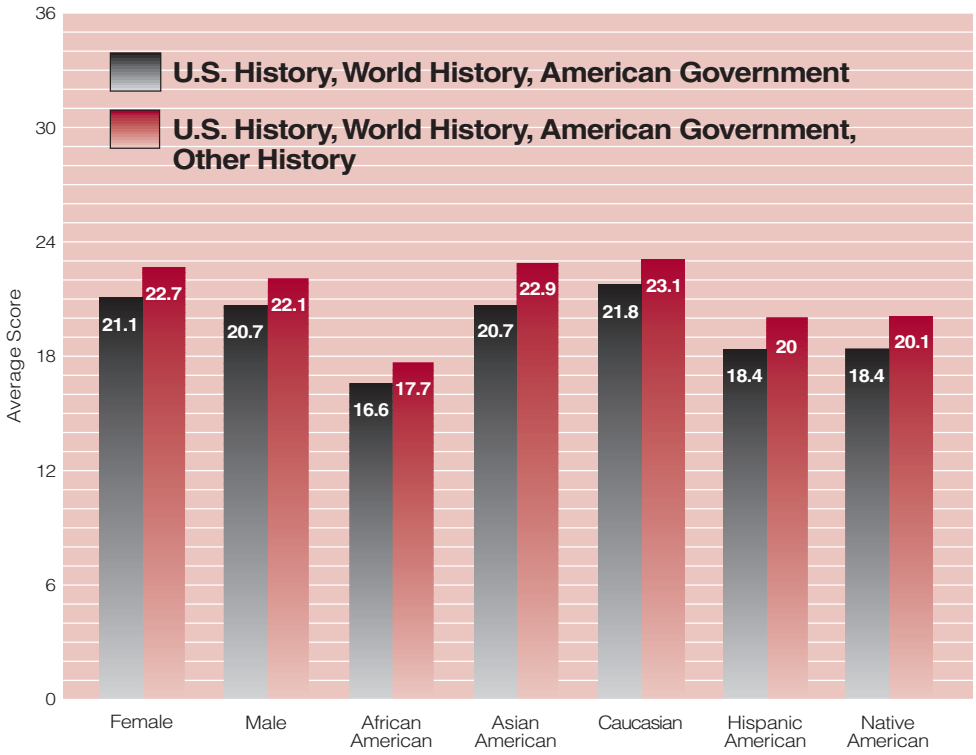


Figure 25: ACT Reading Test Scores for 2004 High School Graduates by Social Studies Course Sequence, Gender, and Race/Ethnicity

What percent of the 2004 class took more than core in social studies?

Only 46 percent of the 2004 ACT-tested high school graduates took another social studies course in addition to the three-year social studies core.

— ACT, 2004

More science coursework greatly increases the likelihood that students will meet the ACT College Readiness Benchmark for Biology. Only 13 percent of students taking less than three years of science met the benchmark, compared to 19 percent of the students who took General Science, Biology, and Chemistry; 38 percent who took these three years plus a physics course; and 45 percent who took Biology, Chemistry, and Physics (Figure 26).

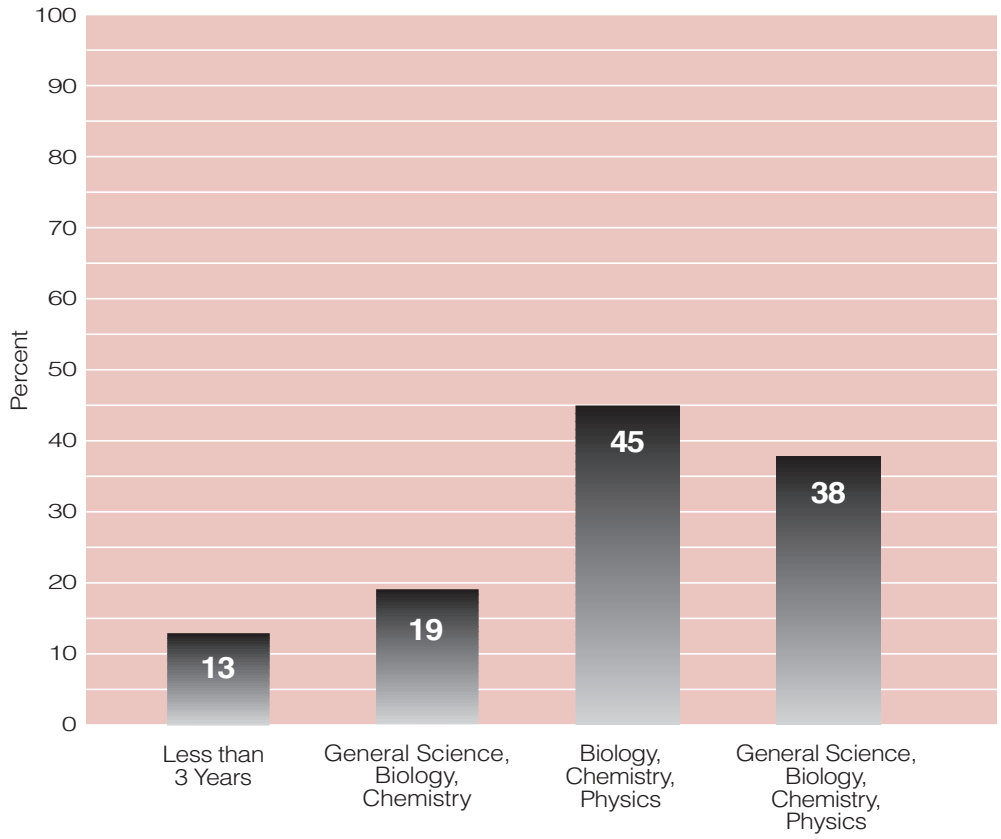


Figure 26: 2004 ACT-tested High School Graduates Meeting College Biology Benchmark by Science Course Sequence

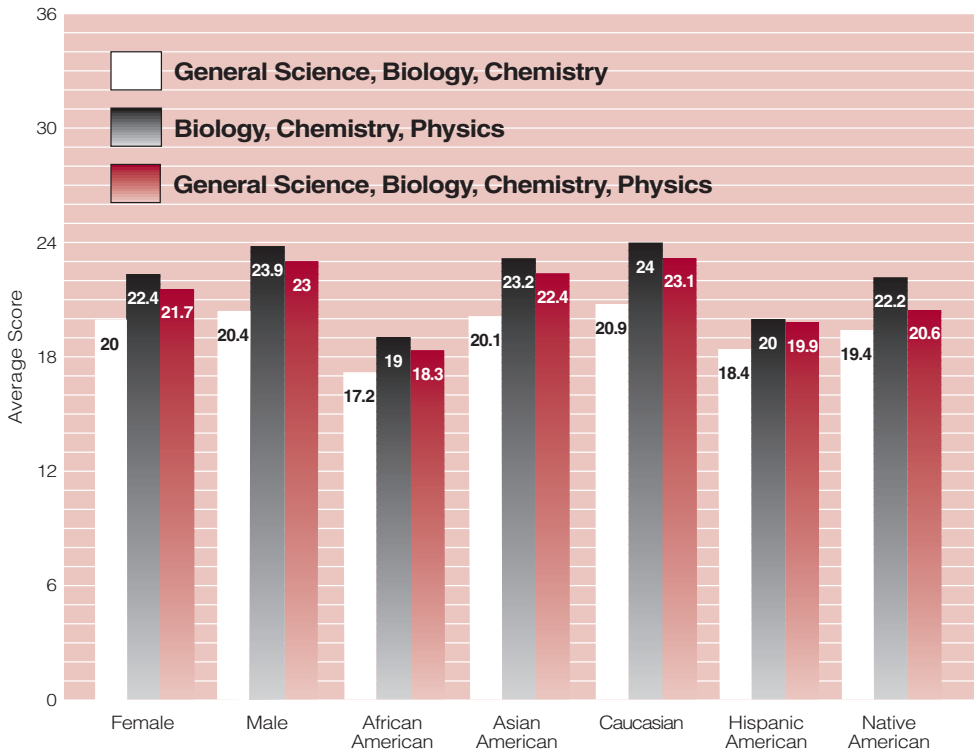


Figure 28: ACT Science Test Scores for 2004 High School Graduates by Science Course Sequence, Gender, and Race/Ethnicity

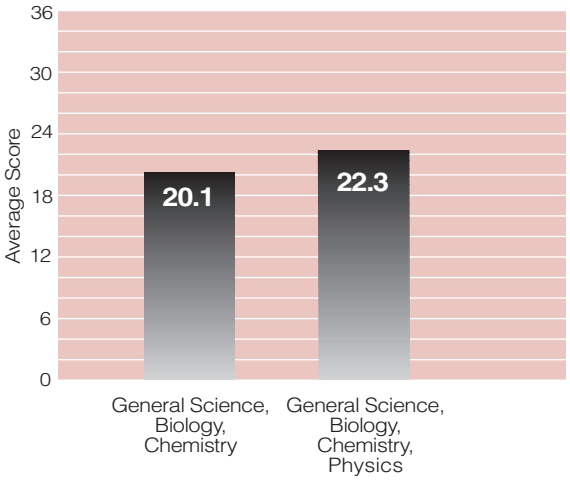


Figure 27: ACT Science Test Scores for 2004 High School Graduates by Science Course Sequence (1)

Taking more science courses significantly improves students' ACT Science Test scores. Figure 27 shows the average ACT Assessment Science Test scores for students who took the core sequence of three courses consisting of General Science, Biology, and Chemistry, and for those who took this sequence plus Physics. As in the other three ACT Assessment tests, those who took an additional course beyond this core sequence performed better on the Science Test than did students who took only the core sequence of three courses. And the trend again holds for both genders and all racial/ethnic groups (Figure 28).

What percent of the 2004 class took rigorous science courses?

Only 42 percent of the 2004 ACT-tested high school graduates took a physics course.

— ACT, 2004

But compare the effect on student performance when the science core curriculum sequence is defined as Biology, Chemistry, and Physics rather than when it is defined as General Science, Biology, and Chemistry. Students who took Biology, Chemistry, and Physics outscored not only those students who took General Science, Biology, and Chemistry but also those who took one additional year of science coursework (Figure 29). The difference in performance between the Biology-Chemistry-Physics sequence and the four-year sequence is likely due to the types of students who elect to take these particular course sequences, a topic that will be addressed later.

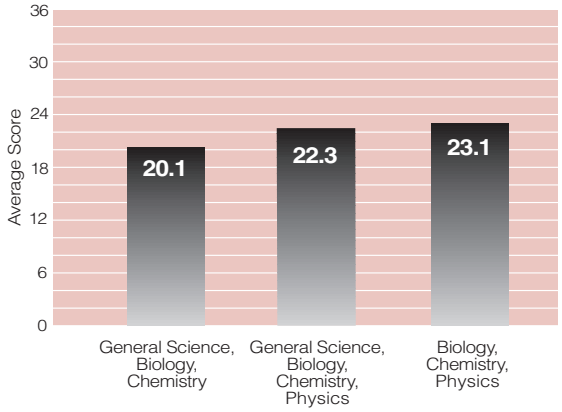


Figure 29: ACT Science Test Scores for 2004 High School Graduates by Science Course Sequence (2)

The Value Added by Physics

Physics is a key course. The average ACT Assessment Science Test scores are higher for students who took Physics than for students who did not, regardless of what other science courses they took in high school (Figure 30). On average, the Physics takers outscored the non-Physics takers by 2.6 points—the same improvement, incidentally, that students taking the ACT Assessment Mathematics Test saw when they took Trigonometry in addition to the mathematics core.

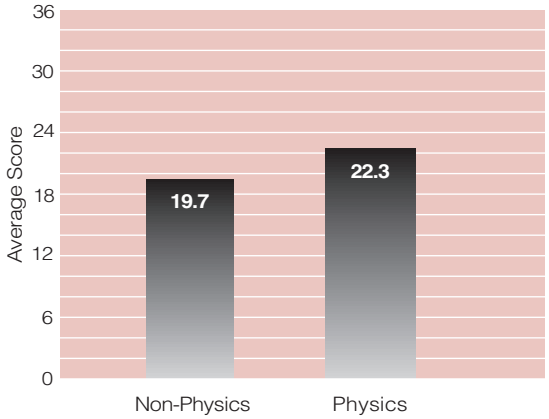


Figure 30: ACT Science Test Scores for 2004 High School Graduates Taking and Not Taking Physics

Based on these results, which hold for males and females and for all racial/ethnic groups, taking Physics has a positive impact on students' college readiness.

The Value Added by Calculus

If we compare Calculus takers and non-Calculus takers regardless of curriculum, as we did with Physics takers and non-Physics takers (Figure 30), Calculus takers on average outscored non-Calculus takers on the Mathematics Test by *5.3 points* (Figure 31). And again, the trend holds for both genders and for all racial/ethnic groups.

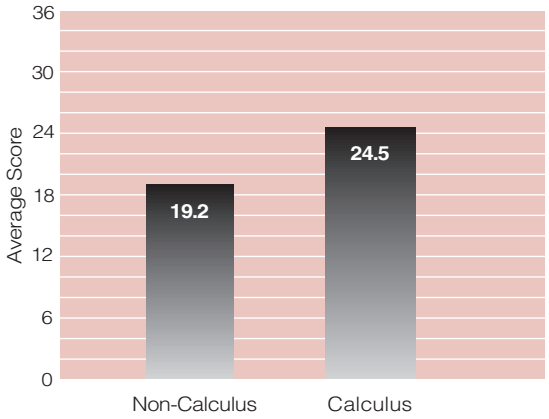


Figure 31: ACT Mathematics Test Scores for 2004 High School Graduates Taking and Not Taking Calculus

Value Added: A Closer Look

Students gain from taking more rigorous courses regardless of their achievement level. One of the confounding factors in interpreting the impact on ACT Assessment performance of course patterns is the fact that students select themselves into particular course patterns. Because students select the courses they take, the average test scores associated with course patterns reflect not only the contribution of course content but also the achievement level of the students who elect to take a particular course sequence.

We reanalyzed the 2004 data to isolate the value-added effect of each course by controlling for student achievement level, using students' self-reported high school grade-point average and grade level, both collected through the ACT Assessment program.

The value-added results of particular math courses when achievement is controlled are shown in Figure 32. The average increase in ACT Mathematics Test scores for those students taking a core preparation program of Algebra I, Geometry, and Algebra II compared to those who are taking less than three courses (less than core) is 1.8. We then see the value added by additional courses beyond Algebra II: for instance, taking Advanced Mathematics results in an average score increase of 1.7 for all students regardless of achievement. Cumulatively, the potential average score increase for students spans nearly 6 score points, *regardless of the level of student achievement.*

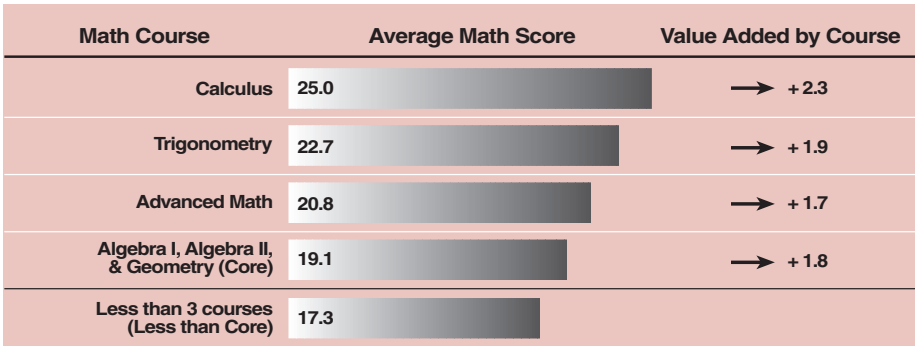


Figure 32: Value Added by Mathematics Courses When Achievement Is Controlled

This finding is supported by Adelman (1999) who stated, "Of all pre-college curricula, the highest level of mathematics one studies in secondary school has the strongest continuing influence on bachelor's degree completion. Finishing a course beyond the level of Algebra 2 . . . more than doubles the odds that a student who enters postsecondary education will complete a bachelor's degree."

A similar summary of the value added by science courses when achievement is controlled is shown in Figure 33. Note that Chemistry adds 1.3 score points on average to the ACT Science Test score, as does Physics. Taken together, Chemistry and Physics on average can increase student scores on the ACT Science Test by as much as 2.6 score points over General Science or Biology alone, *regardless of the level of student achievement.*

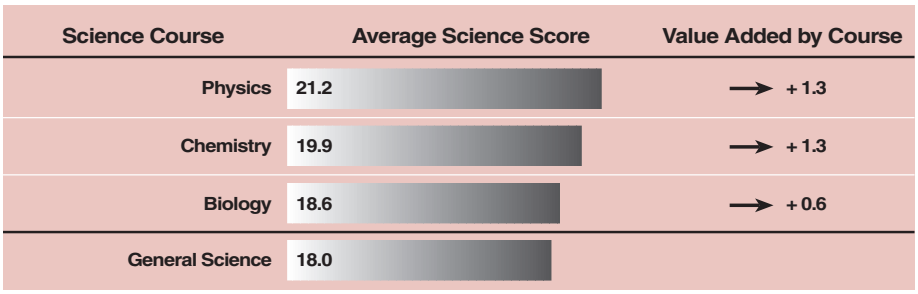


Figure 33: Value Added by Science Courses When Achievement Is Controlled

Summary

Students who take a minimum core curriculum are more likely to be ready for college-level work than are students who do not take the core. But students who take rigorous courses beyond the recommended minimum number of core courses are even more likely to be ready for college. And students whose beyond-core coursework includes courses in advanced mathematics beyond Algebra II (such as Trigonometry), as well as Biology, Chemistry, and Physics, are *likeliest of all* to be college ready. And this is true of students at all levels of achievement, not just the high achievers.

We are not saying that a concerted effort to improve the rigor of the core courses wouldn't help. It most certainly would. However, our data are based on the realities of the quality and content of the core courses as they currently exist. Without any improvement in the rigor of the core courses, additional higher-level courses are necessary for students to be prepared.

3

It's Time to Refine the Core Curriculum

To be ready for college and work, every high school student should be prepared and encouraged to take and do well in rigorous* Courses for Success *that include one or more advanced mathematics courses beyond Algebra II (e.g., Trigonometry) as well as Biology, Chemistry, and Physics.

Our nation is in a readiness crisis. Too few of our students are prepared to enter the workforce or postsecondary education without additional training or remediation when they graduate from high school. And far too many have to take remedial courses as part of their postsecondary educations (National Center for Education Statistics, 2004). As a consequence, first-year students are dropping out of school in alarming numbers: one in four freshmen at four-year institutions and one in two freshmen at two-year institutions fails to return for a sophomore year (Barth, 2003).



Students who are ready for college-level work are much more successful in college than those who are not. Our research consistently shows a strong, positive relationship between performance on the ACT Assessment tests and college success. Students who obtain higher scores on the ACT Assessment are more likely to earn higher grade-point averages in college and stay in college (Ziomek and Harmston, 2004). Moreover, our research shows that when students meet or exceed *all three* of the ACT College Readiness Benchmarks, a clear majority of these students (83 percent) returns to college after the first year—the year in which the national collegiate dropout rates are the highest (Ziomek and Harmston, in press). And when students take one or more *Courses for Success*—including advanced mathematics courses beyond Algebra II as well as Biology, Chemistry and Physics—they have the best chance to be ready to enter college and work without need for remediation.

All students should be expected to be ready for college and work, not just those traditionally considered "college bound." We support the conclusion of the Education Trust that "a diploma should prepare its holder for both postsecondary education and the demands of the workplace" (Barth, 2003). The American Diploma Project (2004) reached the same conclusion: "a college and workplace readiness curriculum should be a graduation requirement, not an option, for all high school students." Today's economy increasingly requires highly sophisticated technological skills at all levels, and all students should have the opportunity to take the courses that will best prepare them to succeed after high school, regardless of their specific educational or career plans. All students can benefit from rigorous course content that is based on the knowledge and skills students need in college and in the workplace. The data tell us that these rigorous courses benefit all students, not just a select few.

All students should be prepared and encouraged to take the *Courses for Success.* The high school core curriculum, defined in terms of minimum numbers of courses students need to take to be ready for college and work, is not sufficient given the quality and the intensity of the core courses students are now taking in high school. Our research data show that when students take the *Courses for Success*, they all benefit, regardless of achievement level, and are much better prepared for college and work. Students don't have to take honors or advanced placement courses to be college ready.

Courses that up to now have been considered additional courses beyond the core curriculum appear to have the most positive impact on college readiness for all students, regardless of achievement level, because these courses are covering the rigorous skills students need after high school. Although our research shows that students can also increase their readiness by taking Speech in addition to four years of English, or an additional history course in addition to three years of social studies, the score increases resulting from these courses are not of the same magnitude as those yielded in math and science. We therefore recommend that all students be prepared and encouraged to take the *Courses for Success* that include at least one advanced mathematics course beyond Algebra II, and Biology, Chemistry, and Physics.

Students *can* rise to the challenge. Can *all* students do this work? Many Americans doubt that all students are capable of learning subjects like trigonometry and physics. We think they can, and our research and that of others supports our confidence. Barth (2003) cites the work of Hallinan (2002), who found that assigning students higher-level mathematics coursework improved student performance regardless of their level of prior achievement, and that, when

assigned such coursework, the lowest achievers made the most dramatic progress—moving, for example, from the 27th to the 51st percentile after being placed in a top-level math course. Barth also summarizes the work of U.S. Department of Education researchers who examined the effect of enrolling different types of students in different high school curricula: "Their analysis found that even students who enter high school with test scores in the lowest quartile grow more in college-prep courses than they do in either the vocational or general courses they are typically enrolled in."

We must recognize that this crisis cannot be resolved at the high school level alone. Students need to enter high school with a solid and broad foundation of academic skills.

- **There are students *who are succeeding.*** Our data tell us that, overall, 22 percent of the 2004 ACT-tested high school graduating class met or exceeded all three College Readiness Benchmarks. These students likely entered high school with the requisite foundational skills, took rigorous courses, worked hard in those courses, and are now ready to enter college and work.

- **There are students *who can succeed, but who aren't now preparing to succeed.*** Our data also tell us that there are substantial percentages of students who met one or two of the benchmarks but did not meet all three (Figure 34).

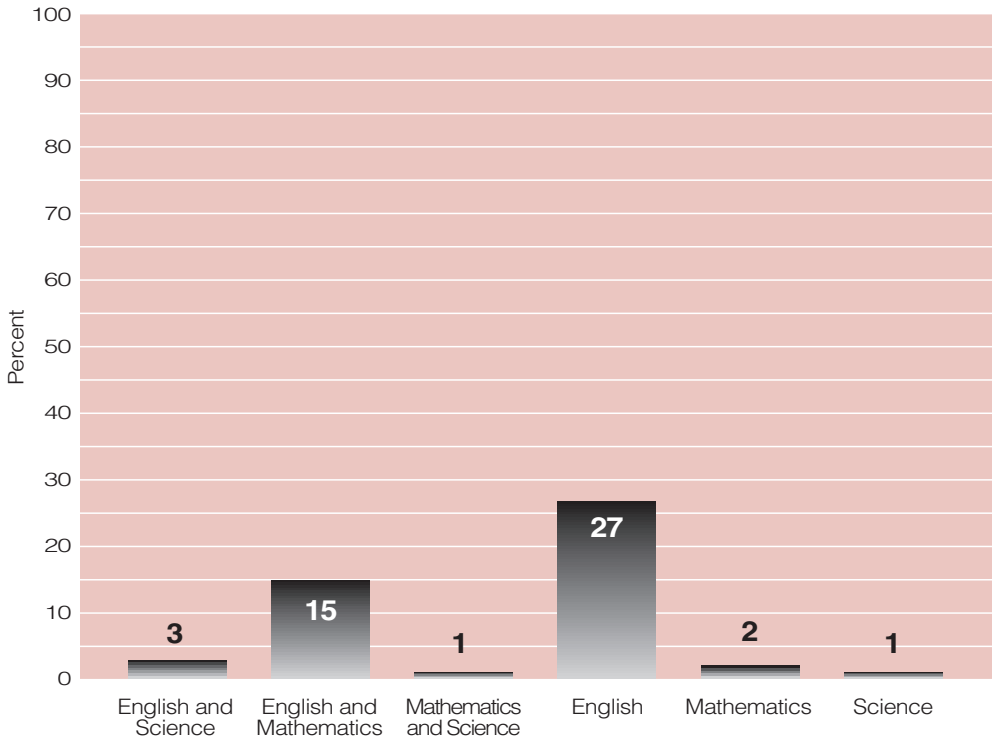


Figure 34: 2004 ACT-tested High School Graduates Meeting One or Two College Readiness Benchmarks

These students could meet or exceed the benchmarks by doing just a little bit more. For example, they could significantly increase their Mathematics Test scores by taking additional math courses beyond Algebra II (see Figure 32). They could increase their Science Test scores by taking Chemistry and Physics in addition to Biology (see Figure 33). As many as *49 percent* of the 2004 ACT-tested high school graduates could have made substantial improvements in their readiness for college while they were still in high school.



- **There are students *who aren't yet, but could be, ready to succeed.*** We estimate that there are still far too many students—at least 29 percent who took the ACT Assessment and did not meet any of the benchmarks, plus an undefined percentage who did not take the ACT Assessment—who are not ready for college or work. These students likely lack the foundational skills when they enter high school and do not take either an adequate number or kind of core courses. These students need to be identified for intervention much earlier, certainly before middle school, so that they can strengthen their foundational skills in English, mathematics, and science before they enter high school.

What Can Be Done?

What, then, can be done to encourage more students to take and do well in the critical *Courses for Success*? Clearly, the actions that are necessary for change will neither happen overnight nor should they be the responsibility of educators alone. To ensure that all students have the opportunity to be ready for college and work will take the efforts of educators and policymakers, business and community leaders, and parents. All of us have crucial roles to play in helping our students prepare for college and the workplace. Together, we *can* make it happen.

Ability and Access

The conventional wisdom in American education has it that only the "top" students can handle algebra and high-level English. But not only is the identification of "top" students a slippery affair, the unlucky students classified as "low-ability" never have a chance. Clearly these students are able *when they have* access *to the content. But they have to get into the right courses first.*

—Barth, 2003

What Can Educational Leaders and Policymakers Do?

Common Focus

- Determine if there is a common understanding among K–12 and higher education officials as to what students need to know to be ready for college and workplace success.
- Use ACT's Standards for Transition® as a common language to define these expectations. (See the Appendix for more information about the Standards for Transition.)
- Conduct ongoing research on ways to positively affect student readiness for college and work at all levels: national, state, and local.
- Help build information bridges between K–12 and state higher education systems with annual reports provided by K–12 to higher education that describe the characteristics of the incoming student body, and with follow-up reports provided by higher education to K–12 that summarize actual student success one year later.
- Have postsecondary educators conduct in-service activities with K–12 teachers to share upper-level teaching expertise across the two systems.
- Integrate information about K–12 longitudinal assessment systems into teacher education programs to prepare new teachers for the kinds of information they will be receiving on a regular basis about their future students; provide pre-service teachers with the tools they need to become assessment-literate professionals.

High Expectations

- Raise expectations that *all* students can meet college and workplace readiness standards.
- Compare school and state standards to college readiness standards, using ACT's Standards for Transition.
- Identify college readiness standards that are missing from school and state standards and incorporate them as expectations for all students.
- Provide pre-service teachers in teacher education programs with the knowledge and tools they need to be able to prepare all students for college and work.

Rigorous Curriculum

- Evaluate the K–8 curriculum to ensure that the foundational skills in reading, writing, and math are being introduced early and appropriately, and are being reinforced and mastered at the appropriate times.
- Ensure that every student has the opportunity to learn these college readiness skills and that the *Courses for Success* (Biology, Chemistry, Physics, and advanced mathematics courses beyond Algebra II) are offered at every high school, through increased course offerings in high schools, dual enrollment opportunities, summer bridge programs, distance learning, or other enrichment offerings.
- Ensure that teachers are prepared to teach rigorous courses and have staff development opportunities to continuously update their subject matter knowledge and teaching skills.
- Evaluate and improve the K–12 curricular alignment of curriculum frameworks in English/language arts, mathematics, and science to ensure that the important college/work readiness skills are being introduced, reaffirmed, and mastered at the appropriate times in K–12 education.
- Evaluate and improve the rigor of the core courses and the *Courses for Success* to make sure that they emphasize the skills students need to be ready for success after high school.
- Provide resources for teachers that offer model lessons, sample assignments and student work, and other support to help all teachers teach to the same rigorous standards.
- Commit funding to curriculum improvement initiatives.

Student Guidance

- Expand and evaluate efforts to provide career and educational planning services to all students.
- Ensure that career and educational planning activities are begun early, at least by the middle school/junior high school years.
- Raise student aspirations using systematic approaches like that provided by ACT's Educational Planning and Assessment System (EPAS), so that all students can consider—and prepare for—the option of college.
- Take steps to ensure that all students are taking an adequate number and kind of high school courses.
- See that parents are involved in key educational and postsecondary planning steps.

Measure Progress

- Redirect funding to implement an achievement-based college readiness measure, such as the ACT Assessment, as part of a statewide assessment system.
- Assess students' foundational skills on a routine basis in elementary school to identify those students who are falling behind early, when there is still time to intervene and strengthen these skills.
- Identify and improve student readiness for college and work early and often using longitudinal student progress assessments like ACT's Educational Planning and Assessment System (EPAS).
- Incorporate college and workplace readiness measures into statewide school reporting and accountability/reward systems.

What Can Business and Community Leaders Do?

Common Focus

- Raise awareness within the business community and the broader community at large about the importance of all students being ready for college and work when they graduate from high school.
- Encourage a common understanding between K–12 and postsecondary institutions as to what students need to know to be ready for college and workplace success. Identify a common set of expectations for students.
- Establish collaborations between business and education that have a mission to promote, monitor, and support college and work readiness for all students.

High Expectations

- Raise expectations that *all* students can meet college and workplace readiness standards.
- Encourage educators to incorporate college and workplace readiness standards into their curricular frameworks in a coherent, focused, grade-by-grade progression.
- Encourage school boards to adopt and implement a district-wide policy that reinforces the commitment that all students be enrolled in a rigorous high school curriculum that prepares all students for college and work.

Rigorous Curriculum

- Promote a systematic evaluation of school curriculum frameworks in English/language arts, mathematics, and science to ensure that they are introducing, reaffirming, and confirming mastery of the important rigorous skills needed for college and workplace success.
- Promote a systematic evaluation of the core curriculum and the *Courses for Success* (Biology, Chemistry, Physics, and advanced mathematics courses beyond Algebra II) to make sure that teachers are teaching the rigorous skills that students must learn.
- Promote collaborations with postsecondary institutions and with online providers of postsecondary courses to expand course offerings to students through dual enrollment, summer enrichment programs, or distance learning.
- Commit funding to curriculum improvement initiatives.

Student Guidance

- Expand and evaluate efforts to provide career and educational planning services to all students.
- Ensure that career and educational planning activities are begun early, at least by the middle school/junior high school years.
- Through media campaigns, raise public awareness of the importance of taking an adequate number and kind of high school courses.

Measure Progress

- Provide funds to schools for assessments that identify those students who are not making adequate progress, whose aspirations are too low, or whose coursework plans do not include the critical courses necessary for college and workplace readiness.

- *In the United States, skills, especially at the college level, are playing an increasingly significant role in allocating economic opportunity.*
- *Technology and earnings are inextricably linked, and the effects of technological changes have favored high-wage workers.*

— Carnevale and Desrochers, 2003



Conclusion

If we continue to deny students the opportunity to take those courses that will best prepare them to succeed after high school, the consequences will be dire: we will have more students who are unprepared for college and work. More of the students who do enter college will need to take remedial coursework, which, in turn, decreases their chances of graduating from college with every remedial course they take. And remediation itself is costly—recent research estimates that America's postsecondary institutions and state governments spend anywhere from $260 million to $1 billion per year on remediation (Barnett, 2002).

It is society's responsibility to ensure all students powerful learning that prepares not only for a job, but for career advancement and a fulfilling life as well. Without this commitment, individual students and the broader community are shortchanged. . . . As college education now becomes commonplace, all students must have the opportunity to achieve the most empowering forms of learning.

— Association of American Colleges and Universities, 2002

The goal of a transformed system of high schools is to prepare every student to succeed in postsecondary education without remediation. While not every adolescent will or must attend a four-year college immediately after high school, some postsecondary education—whether in a four-year college, a high-quality technical training program, or a community college—is now a necessity on the path to a successful adulthood.

— Cohen, 2002

Perhaps more important, we will be depleting our nation's most valuable resource—our youth—by depriving so many young students of the futures they so richly deserve. Carnevale and Desrochers (2003) summarize the issue as follows: "The United States' reliance on postsecondary education and training as the threshold for allocating opportunity means that poorly educated individuals, rather than employers or governments, pay the price of educational inequality. Individuals who do not acquire college-level skills are more likely to be forced into low-wage and low-benefit jobs."

Two decades after *A Nation at Risk,* the nation is still at risk. It is time to refine the high school core curriculum to prepare all students for college and work.

Appendix

The conclusions in this report are based on large samples of students in our nation's schools who participated in ACT's college readiness programs: EXPLORE, PLAN, and/or the ACT Assessment. The students taking the ACT Assessment represent about 40 percent of all graduating seniors across the country. While this may not constitute a nationally representative sample, we believe that we cannot ignore what the data are telling us.

This section provides detailed information on the data sources and methodologies used in this report.

ACT's Educational Planning and Assessment System (EPAS)®

The data in this report come primarily from the results of the 2003–2004 administrations of the assessment programs that make up ACT's Educational Planning and Assessment System (EPAS)®. EPAS consists of three aligned programs:

- **EXPLORE®,** for students in grades 8 and 9, provides baseline information on the academic preparation of students that can be used to plan high school coursework. The data cited primarily in this report are based on 362,879 eighth-grade students who had taken EXPLORE during the 2003–2004 academic year. Approximately 17 percent of these students were from the East, 38 percent from the Midwest, 38 percent from the Southwest, and 7 percent from the West.

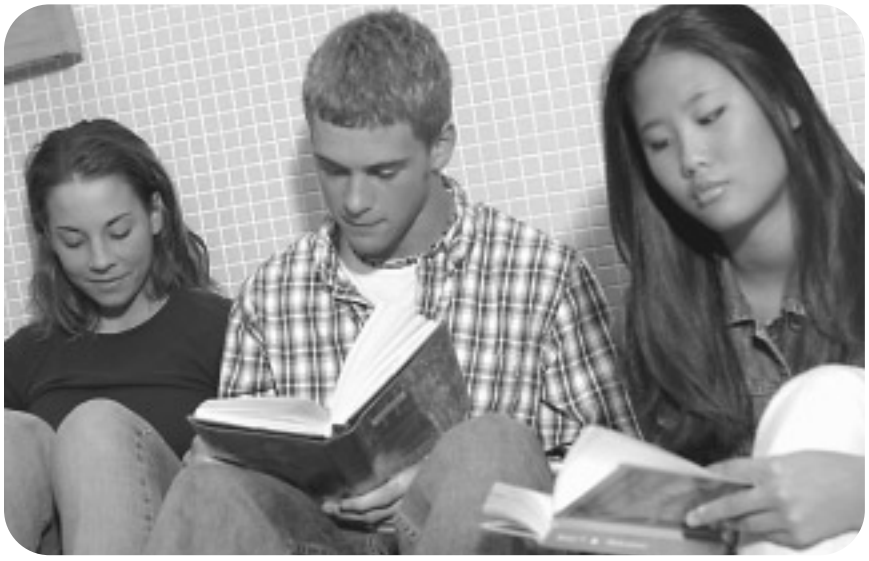
- **PLAN®,** for students in grade 10, provides a midpoint review of students' progress toward their education and career goals while there is still time to make necessary interventions. The data cited primarily in this report are based on 801,640 tenth-grade students who took PLAN during the 2003–2004 academic year. Approximately 20 percent of these students were from the East, 45 percent from the Midwest, 19 percent from the Southwest, and 16 percent from the West.

- The **ACT Assessment®,** for students in grades 11 and 12, measures students' academic readiness to make successful transitions to college and work after high school. The ACT Assessment is the most widely accepted and used test by postsecondary institutions across the U.S. for college admission and course placement. The data cited primarily in this report are based on 1.2 million high school students who took the ACT Assessment and indicated that they would graduate from high school in 2004. Twenty-five percent of these students were from the East, 40 percent from the Midwest, 14 percent from the Southwest, and 19 percent from the West.

ACT is uniquely qualified to report on the nation's level of college readiness. We have been measuring the academic achievement of eleventh-grade and twelfth-grade students since the first administration of the ACT Assessment in 1959, their career aspirations since 1969, and their academic preparation since 1985. We have tracked each of these three areas for tenth graders since the debut of PLAN in 1987, and for eighth graders since 1993, when EXPLORE was added as the newest component of EPAS. Most recently, in 2003, we established the ACT College Readiness Benchmarks, which are defined and discussed in detail below.

For more than forty years the ACT Assessment has served as the "gold standard" for measuring achievement because, unlike other large-scale assessments of academic ability, it is first and foremost an achievement test. It is a measure whose tasks correspond to recognized high school learning experiences, but which at the same time does not precisely duplicate that curriculum. The ACT Assessment measures not an abstract quality, such as intelligence or aptitude, but rather what students are able to do with what they have learned in school.

All three components of EPAS (EXPLORE, PLAN, and the ACT Assessment) measure achievement because each is firmly based in the curriculum of the grade level for which it is intended. Every 3 to 4 years, ACT conducts its National Curriculum Survey®, in which we ask more than 20,000 educators nationwide in grades 7–14 to identify the knowledge and skills that are important for students to know to be ready for college-level work. We also examine the objectives for instruction in grades 7 through 12 for all states that have published such objectives. We also review textbooks on state-approved lists for courses at these grade levels. We then analyze the information to refine the scope and sequence for each section of each EPAS assessment. In this way, rather than imposing a test construct without empirical support, EPAS is able to represent a consensus among educators and curriculum experts about what is important for students to know and be able to do.



EPAS Tests

Each component of EPAS (EXPLORE, PLAN, and the ACT Assessment) consists of four tests: English, Mathematics, Reading, and Science. The skills assessed in each of the tests are summarized below.

English. The items in the English tests assess six elements of effective writing in the two broad categories of usage and mechanics (punctuation, grammar and usage, sentence structure) and rhetorical skills (strategy, organization, style). Spelling, vocabulary, and rote recall of rules of grammar are not tested. The revising and editing issues posed by the items offer a certain richness and complexity. While some items require students to apply their knowledge of standard written English to the task of deciding the best way to write a sentence or sentences, the surrounding context makes the overriding issue that of clear and effective communication of meaning.

Mathematics. The items in the Mathematics tests cover four cognitive levels: Knowledge and Skills, Direct Application, Understanding Concepts, and Integrating Conceptual Understanding. Knowledge and Skills items require the student to use one or more facts, definitions, formulas, or procedures to solve problems that are presented in purely mathematical terms. Direct Application items require the student to use one or more facts, definitions, formulas, or procedures to solve straightforward problems set in real-world situations. Understanding Concepts items test the student's depth of understanding of major concepts by requiring reasoning from a concept to reach an inference or a conclusion. Integrating Conceptual Understanding items test the student's ability to achieve an integrated understanding of two or more major concepts to solve non-routine problems.

Reading. The items in the Reading tests require the student to derive meaning from texts by referring to what is explicitly stated and reasoning to determine implicit meanings and to draw conclusions, comparisons, and generalizations. Items do not test the rote recall of facts from outside the text, isolated vocabulary items, or rules of formal logic. Rather, the test focuses upon the complex of complementary and mutually supportive skills that readers must bring to bear in studying written materials across a range of subject areas.

Science. The items in the Science tests measure students' mastery of the interpretation, analysis, evaluation, reasoning, and problem-solving skills required in the natural sciences. The items require students to recognize and understand the basic features of, and concepts related to, the provided information; to examine critically

the relationships between the information provided and the conclusions drawn or hypotheses developed; and to generalize from given information to gain new information, draw conclusions, or make predictions. The items emphasize scientific reasoning skills rather than recall of scientific content, skill in mathematics, or pure reading ability. The tests pose the kinds of questions that college students of science must answer in planning, carrying out, and evaluating scientific investigations and in studying scientific theories.

EPAS Score Scales

Each test within EXPLORE, PLAN, and the ACT Assessment is scored on a common score scale ranging from 1 (lowest) to 36 (highest). Students receive both total test scores and subtest scores in each of the EPAS programs. For example, the ACT Assessment reports 12 scores: 4 test scores (English, Mathematics, Reading, Science), one composite score, and 7 subscores (2 in English, 3 in Mathematics, and 2 in Reading). Beginning in February 2005, ACT will report 3 additional scores to students who take the new ACT Writing Test: Writing Test score, combined English/Writing score, and narrative comments offered to help students improve their writing.

The ACT Core Curriculum

The core curriculum espoused by ACT is based on the curriculum proposed in 1983 in *A Nation at Risk.* ACT has long held that the core curriculum best prepares students for college or other forms of postsecondary training. The courses that constitute ACT's definition of the core curriculum, by subject area, are:

- English (four years or more)—One year credit each for English 9, English 10, English 11, and English 12;
- Mathematics (three years or more)—One year credit each for Algebra I, Algebra II, and Geometry. One half-year credit each for Trigonometry, Calculus, or other mathematics courses beyond Algebra II (e.g., Computer Mathematics/Computer Science);
- Social studies (three years or more)—One year credit each for American History, World History, and American Government. One-half year credit each for Economics, Geography, Psychology, and other History (e.g., European, State); and
- Natural sciences (three years or more)—One year credit each for General/Physical/Earth Science, Biology, Chemistry, and Physics.

In this report, "core" can always be taken to mean this amount of coursework in these specific subject areas, and "less than core" to mean either anything less than this amount or any curriculum that does not include at least these four subject areas.

ACT College Readiness Benchmarks

ACT works with colleges to help them develop guidelines that place students in courses that are appropriate for their level of achievement as measured by the ACT Assessment. In doing this work, ACT has gathered course grade and test score data from a large number of first-year students and across a wide range of postsecondary institutions. These data provide an overall measure of what it takes to be successful in a standard first-year college course. Data from 98 institutions and over 90,000 students were used to establish the ACT College Readiness Benchmarks, which are median course placement scores that are directly reflective of student success in a college course.

Success here is defined as approximately a 75 percent chance that a student will earn a grade of C or better, and approximately a 50 percent chance that a student will earn a grade of B or better. The courses are the ones most commonly taken by first-year students in the areas of English, mathematics, and science, namely English Composition, Algebra, and Biology. The ACT Assessment scores established as the ACT College Readiness Benchmarks are 18 on the English Test, 22 on the Mathematics Test, and 24 on the Science Test.

ACT College Readiness Benchmarks

College Course	EXPLORE	PLAN	ACT Assessment
English Composition	13	15	18
Algebra	17	19	22
Biology	20	21	24

The College Readiness Benchmarks were based upon a sample of postsecondary institutions from across the U.S. The data from these institutions were weighted to reflect postsecondary institutions nationally. The benchmarks are median course placement values for these institutions and as such represent a *typical* set of expectations. ACT will work with any particular postsecondary institution or group of institutions within a state to conduct its own validation studies to establish local benchmarks that take specific institutional and student characteristics into account.

We have also established scores on EXPLORE and PLAN that correspond to the ACT College Readiness Benchmarks, these scores indicating, based on their performance on EXPLORE (8th-9th grades) and PLAN (10th grade), whether students are on course to be ready for college-level work when they graduate from high school. In EXPLORE these scores are 13 on the English Test, 17 on the Mathematics Test, and 20 on the Science Test; in PLAN, the scores are 15 on the English Test, 19 on the Mathematics Test, and 21 on the Science Test.

ACT's Standards for Transition®

ACT's Standards for Transition® provide a description of the knowledge and skills students are likely to possess based on their scores on EXPLORE, PLAN, and the ACT Assessment. The particular Standards for Transition associated with the ACT College Readiness Benchmarks identify the knowledge and skills students must have in order to succeed in first-year college courses in English Composition, Algebra, and Biology. The Standards are a set of statements that interpret EPAS scores according to the knowledge and skills students in each score range have likely mastered. The Standards relate the scores to the types of skills needed for success in high school and beyond. The following figures show the Standards reflected by the ACT College Readiness Benchmarks for English Composition, Algebra, and Biology.

Figure 35: Standards Reflected by the College Readiness Benchmark for ***English Composition***

	College English Composition Course (ACT English Test Score=18)		
	Topic Development in Terms of Purpose and Focus	***Organization, Unity, and Coherence***	***Word Choice in Terms of Style, Tone, Clarity, and Economy***
Standards for Transition *Score Range 16–19*	■ Identify the basic purpose or role of a specified phrase or sentence ■ Delete obviously irrelevant material from an essay	■ Select the most logical place to add a sentence in a paragraph	■ Delete obviously synonymous and wordy material in a sentence ■ Revise expressions that violate the essay's tone ■ Revise phrases to provide the most specific detail
Standards for Transition *Score Range 13–15*		■ Recognize blatantly illogical conjunctive adverbs	■ Revise sentences to correct awkward and confusing arrangements of sentence elements ■ Revise ambiguous pronouns that create obvious sense problems (e.g., meaning or logic)
Standards for Transition *Score Range 1–12*	■ Students who score in the 1–12 range are most likely beginning to develop the knowledge and skills assessed in the other score ranges.		

Sentence Structure and Formation	*Conventions of Usage*	*Conventions of Punctuation*
■ Use punctuation or conjunctions to coordinate uncomplicated sentences and to avoid awkward-sounding fused sentences or sentence fragments ■ Correct glaringly inappropriate shifts in verb tense or voice	■ Solve such basic grammatical problems as whether to use an adverb or an adjective form, how to form comparative and superlative adjectives, how to ensure straightforward subject-verb and pronoun-antecedent agreement, and when to use the contraction *it's*	■ Provide appropriate punctuation in straightforward situations (e.g., items in a series) ■ Delete commas that disturb the sentence flow (e.g., between modifier and modified element)
■ Use conjunctions or punctuation to join simple clauses ■ Revise shifts in verb tense between simple clauses in a sentence or between simple adjoining sentences	■ Solve such basic usage problems as whether to use a comparative or a superlative adjective and which word to use in such pairs as *past* or *passed*	■ Delete commas that create basic sense problems (e.g., between two parts of a compound noun, between verb and direct object)
■ Students who score in the 1–12 range are most likely beginning to develop the knowledge and skills assessed in the other score ranges.		

Figure 36: Standards Reflected by the College Readiness Benchmark for ***Algebra***

Math	College Algebra Course (ACT Mathematics Test Score=22)			
	Basic Operations & Applications	***Probability, Statistics, & Data Analysis***	***Numbers: Concepts & Properties***	***Algebraic Expressions***
Standards for Transition *Score Range 20–23*	■ Solve routine two-step or three-step arithmetic problems involving concepts such as rate and proportion, tax added, percentage off, computing an average with negative integers, and computing with a given average	■ Translate from one representation of data to another (e.g., a bar graph to a circle graph) ■ Determine the probability of a simple event ■ Exhibit knowledge of simple counting techniques	■ Exhibit knowledge of elementary number concepts including rounding, the ordering of decimals, pattern identification, absolute value, primes, and greatest common factor	■ Manipulate basic algebraic expressions (e.g., substitute integers for unknown quantities, add and subtract simple algebraic expressions [multiply two binomials], and perform straightforward word-to-symbol translations)
Standards for Transition *Score Range 16–19*	■ Solve routine one-step arithmetic problems (using whole numbers, fractions, and decimals) such as single-step percent and calculate a simple average of whole numbers ■ Solve some routine two-step arithmetic problems	■ Read tables and graphs ■ Perform computations on data from tables and graphs ■ Use the relationship between the probability of an event and the probability of its complement	■ Recognize one-digit factors of a number ■ Identify a digit's place value	■ Combine like terms (e.g., $2x + 5x$) ■ Substitute whole numbers for unknown quantities to evaluate expressions
Standards for Transition *Score Range 13–15*	■ Perform one-operation computation with whole numbers and decimals ■ Solve problems in one or two steps using whole numbers ■ Perform common conversions (e.g., inches to feet or hours to minutes) ■ Find equivalent values of coins	■ Perform a single computation using information from a table or chart		■ Exhibit knowledge of basic expressions (e.g., identify an expression for a total as $b + g$)
Standards for Transition *Score Range 1–12*	■ Students who score in the 1–12 range are most likely beginning to develop the knowledge and skills assessed in the other score ranges.			

Equations & Inequalities	Graphical Representations	Properties of Plane Figures	Measurement	Functions
☐ Solve routine first-degree equations	☐ Comprehend the concept of length on the number line ☐ Locate points in the coordinate plane ☐ Exhibit knowledge of vertical and horizontal lines and of their point of intersection ☐ Exhibit knowledge of slope	☐ Exhibit knowledge of basic angle properties and special sums of angle measures (e.g., 90°, 180°, and 360°)	☐ Compute the area and perimeter of triangles and rectangles in simple problems ☐ Use geometric formulas when all necessary information is given	☐ Work with function notation in evaluating simple quadratic functions at integer values
☐ Solve one-step equations having integer or decimal answers	☐ Locate points on the number line and in the first quadrant		☐ Compute the perimeter of polygons when all side lengths are given ☐ Compute the area of rectangles when whole number dimensions are given	
☐ Solve equations in the form $x + a = b$, where a and b are whole numbers or decimals	☐ Identify the location of a point with a positive coordinate on the number line		☐ Estimate or calculate the length of a line segment based on other lengths given on a geometric figure	
☐ Students who score in the 1–12 range are most likely beginning to develop the knowledge and skills assessed in the other score ranges				

Figure 37: Standards Reflected by the College Readiness Benchmark for ***Biology***

	College Biology Course (ACT Science Test Score=24)		
	Interpretation of Data	***Scientific Investigation***	***Evaluation of Experiments, Models, and Assertions***
Standards for Transition *Score Range 24–27*	■ Compare data from a complex table, graph, or diagram ■ Interpolate between data points in a table or graph ■ Identify or use a simple mathematical relationship that exists between data ■ Identify a direct or inverse relationship between variables in a complex table, graph, or diagram ■ Compare or combine data from two simple data sets ■ Combine new, simple information (data or text) with given information (data or text)	■ Understand moderately complex lab procedures ■ Understand simple experimental designs	■ Select a simple hypothesis, prediction, or conclusion that is supported by one or more data sets or viewpoints ■ Identify strengths and weaknesses in one or more viewpoints ■ Identify similarities and differences in two or more viewpoints ■ Identify key issues or assumptions in an argument or viewpoint ■ Determine whether new information supports or weakens a viewpoint or hypothesis
Standards for Transition *Score Range 20–23*	■ Compare data from a simple table, graph, or diagram ■ Determine whether a relationship exists between two variables ■ Identify an inverse relationship between variables in a simple table, graph, or diagram ■ Translate information (data or text) into graphic form ■ Select data from a complex table, graph, or diagram (e.g., a table or graph with more than three variables)	■ Understand simple lab procedures ■ Identify the control in an experiment	
Standards for Transition *Score Range 16–19*	■ Select data from a simple table, graph, or diagram (e.g., a table or graph with two or three variables; a food web) ■ Identify basic features from a table or graph (e.g., headings, units of measurement, axis labels) ■ Understand basic scientific terminology ■ Find basic information in a brief body of text ■ Identify a direct relationship between variables in a simple table, graph, or diagram		
Standards for Transition *Score Range 13–15*	■ Select a single piece of textual (nonnumerical) information from a table ■ Select the highest/lowest value from a specified column or row in a table ■ Select a single data point from a simple table, graph, or diagram		
Standards for Transition *Score Range 1–12*	■ Students who score in the 1–12 range are most likely beginning to develop the knowledge and skills assessed in the other score ranges.		

References

ACT. (2004). ACT National Data Release. Iowa City, IA: ACT, Inc.

Adelman, C. (1998). *National Crosstalk.* San Jose, CA: National Center for Public Policy and Higher Education.

Adelman, C. (1999). *Answers in the Toolbox: Academic Intensity, Attendance Patterns and Bachelor's Degree Attainment.* Washington, D.C.: U.S. Department of Education.

American Diploma Project, The. (2004). *Ready or Not: Creating a High School Diploma That Counts.* Washington, D.C.: Achieve, Inc.

Association of American Colleges and Universities. (2002). *Greater Expectations: A New Vision for Learning as a Nation Goes to College.* Washington, D.C.: Association of American Colleges and Universities.

Barnett, E. (2002). "The Costs and Benefits of Remedial Education." Retrieved on August 22, 2004, from http://occrl.ed.uiuc.edu/Publicaions/papers/Costs%20Remedial%20Education-%20EB1.doc.

Barth, P. (2003). "A Common Core Curriculum for the New Century." *In Thinking K–16* 7:1 (Winter 2003). Washington, D.C.: The Education Trust, Inc.

Business–Higher Education Forum. (2003). *Building a Nation of Learners: The Need for Changes in Teaching and Learning to Meet Global Challenges.* Washington, D.C.: American Council on Education.

Callan, P. M., and Finney, J. E. (2003). *Multiple Pathways and State Policy: Toward Education and Training Beyond High School.* Boston: Jobs for the Future.

Carnevale, A. P., and Desrochers, D. M. (2003). *Standards for What?: The Economic Roots of K-16 Reform.* Princeton, N.J.: Educational Testing Service.

Cohen, M. (2002). *Transforming the American High School: New Directions for State and Local Policy.* Boston/Washington, D.C.: Jobs for the Future/The Aspen Institute.

Gambiano, R., Denny, G., and Devore, J. (2000). "College Student Retention at a Midwest University: A Six-Year Study." In *Journal of College Admission* 166 (Winter 2000). Alexandria, VA: National Association for College Admission Counseling.

Hallinan, M. T. (2002). "Ability Grouping and Student Learning." Paper prepared for Brookings Institution conference, *The American High School Today,* Washington, D.C., May 14–15, 2002.

Haycock, K. (2003). Foreword to Carnevale and Desrochers, *Standards for What?: The Economic Roots of K-16 Reform.* Princeton, N.J.: Educational Testing Service.

Mortenson, T. (1999). *Postsecondary Opportunities.* Washington, D.C.: U.S. Department of Education.

National Center for Education Statistics. (2004). *The Condition of Education 2004.* Retrieved August 21, 2004, from http://nces.ed.gov//programs/coe/2004/section5/indicator31.asp.

National Center for Public Policy and Higher Education, The. (2004). "The Educational Pipeline: Big Investment, Big Returns." In *Policy Alert* (April 2004). San Jose, CA: The National Center for Public Policy and Higher Education.

National Commission on Excellence in Education, The. (1983). *A Nation at Risk: The Imperative for Educational Reform.* Washington, D.C.: U.S. Department of Education.

National Commission on the High School Senior Year. (2001). *Raising Our Sights: No High School Senior Left Behind.* Princeton, N.J.: The Woodrow Wilson National Fellowship Foundation.

Somerville, J., and Yi, Y. (2002). *Aligning K–12 and Postsecondary Expectations: State Policy in Transition.* Washington, D.C.: National Association of System Heads.

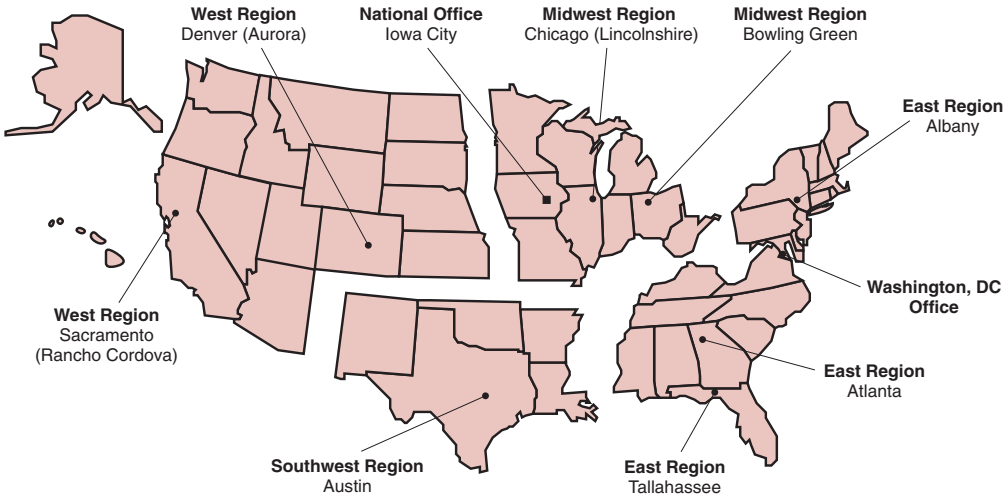
U.S. Department of Education. (2002). *Coming of Age in the 1990s: The Eighth Grade Class of 1988 12 Years Later.* Washington, D.C.: U.S. Government Printing Office.

Venezia, A., Kirst, M. W., and Antonio, A. L. (2003). *Betraying the College Dream: How Disconnected K–12 and Postsecondary Education Systems Undermine Student Aspirations.* Stanford, CA: The Stanford Institute for Higher Education Research.

Ziomek, R. L., and Harmston, M. T. (2004). "Retention, ACT Composite Score, and College GPA: What's the Connection?" *ACT Information Brief Series,* No. 2004-1. Iowa City, IA: ACT, Inc.

Ziomek, R. L., and Harmston, M. T. (in press). "ACT College Readiness Benchmarks and College Retention: What's the Connection?" (title tentative). *ACT Information Brief Series.* Iowa City, IA: ACT, Inc.

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