

**COLLEGE
READINESS**



Rigor at Risk: **Reaffirming Quality** **in the High School** **Core Curriculum**



ACT[®]

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Rigor at Risk:

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High School Core Curriculum

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A Message from the President and COO of ACT's Education Division

For decades, ACT research has consistently shown that high school students who take a minimum recommended core curriculum—four years of English and three years each of mathematics, science, and social studies—are likely to be more prepared for college when they graduate than are students who do not take this curriculum.

But in recent years it has become increasingly apparent that, while taking the right number of courses is certainly better than not, it is no longer enough to guarantee that students will graduate ready for life after high school. Only one-quarter of ACT-tested 2006 high school graduates who took a core curriculum were prepared to take credit-bearing entry-level college courses in all four subject areas with a reasonable chance of succeeding in those courses. Even students who take a number of additional higher-level courses beyond the minimum core curriculum are not always likely to be ready for college either.

We at ACT believe that these findings are evidence of a need for greater rigor in the high school core curriculum—specifically, the need for high school core courses to focus on the essential knowledge and skills needed for success in postsecondary education. This report identifies the large gap between secondary and postsecondary education in the U.S. and focuses on successful strategies for eliminating this gap. Our nation's high schools must offer every student a rigorous core curriculum that will prepare them for college and work by the time they graduate.

It is time to reaffirm quality in the high school core curriculum.
We can meet the challenge.

Cynthia B. Schmeiser

President and Chief Operating Officer, ACT Education Division
March 2007

Introduction

Among the motivations behind the federal government's publication of *A Nation at Risk* (National Commission on Excellence in Education, 1983) were the desire to see more students graduate from high school prepared for college and work and the need for more students to attend college. Another motivation was the importance of enabling more first-year college students to succeed in college: that is, to perform well in their courses, return to college for their second year (and beyond), and persist to a degree. The authors of *A Nation at Risk* proposed, among other recommendations, that every high school in the United States require its graduates to take a “core” curriculum: a minimum number of courses designed to provide students with a “foundation of success for the after-school years” (p. 24). This foundation would consist of a set of universal knowledge and skills that graduates would be able to put to good use regardless of their specific educational or work objectives.

Since then, almost every state has made significant efforts to improve its education system. Nearly a quarter-century later, in a climate in which U.S. workers are dealing with new forms of technology and facing the challenges of a global economy, it is not only reasonable but increasingly urgent to ask: Have we succeeded in fulfilling the goals of *A Nation at Risk*?

ACT research has consistently shown that high school students who take a minimum recommended core curriculum—four years of English and three years each of mathematics, science, and social studies—are likely to be more prepared for college when they graduate than are students who do not take this curriculum. Decades of research bear out this recommendation.

However, in recent years it has become increasingly apparent that, while taking the right *number* of courses is certainly better than not, it is no longer enough to guarantee that students will graduate ready for life after high school (Dougherty, Mellor, & Jian, 2006). A powerful example of this is the fact that, as defined by ACT's national college readiness indicators, the ACT College Readiness Benchmarks, three out of four ACT-tested 2006 high school graduates who take a core curriculum are not prepared to take credit-bearing entry-level college courses with a reasonable chance of succeeding in those courses (Figure 1).

We recommend that state and local high school graduation requirements be strengthened and that, at a minimum, all students seeking a diploma be required to lay the foundations in the Five New Basics by taking the following curriculum during their 4 years of high school: (a) 4 years of English; (b) 3 years of mathematics; (c) 3 years of science; (d) 3 years of social studies; and (e) one-half year of computer science. For the college-bound, 2 years of foreign language in high school are strongly recommended in addition to those taken earlier.

Whatever the student's educational or work objectives, knowledge of the New Basics is the foundation of success for the after-school years and, therefore, forms the core of the modern curriculum.

—*National Commission on Excellence in Education, 1983*

These statistics for the ACT-tested high school graduating class of 2006 who took a core curriculum suggest that about one-fourth of these students are ready for college-level work in English, mathematics, social science, and natural science, while about one-fifth are not ready in any of these subject areas and the remaining students (more than half) are ready in one to three areas

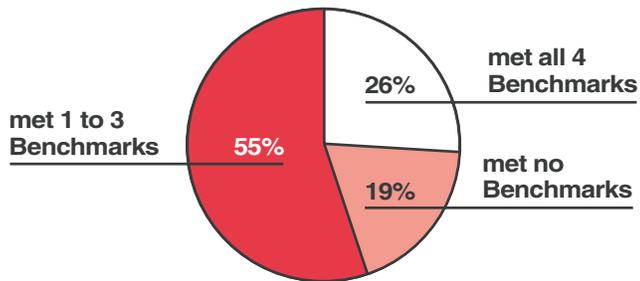


Figure 1: ACT College Readiness Benchmark Attainment¹ of Students Taking Core Curriculum, by Number of Benchmarks Attained (2006 High School Graduates)²

but not in all. Altogether, approximately 74 percent of ACT-tested 2006 high school graduates who took a core curriculum lack at least some of the skills needed for postsecondary success. Most of these students may need only a small amount of additional preparation to be ready for college, but 19 percent need substantial help in all four subject areas in order to be ready for college-level work.

ACT research also suggests that students today do not have a reasonable chance of becoming ready for college unless they take a number of additional higher-level courses beyond the minimum core, and that even students who do take these additional higher-level courses are not always likely to be ready for college either. This

finding is in part a reflection on the quality and intensity—in other words, the *rigor*—of the high school curriculum. Without improving the quality and content of the core, it appears that most students need to take additional higher-level courses to learn what they should have learned from a rigorous core curriculum, with no guarantee even then that they will be prepared for college-level work.

Is it no longer reasonable to expect, as did the authors of *A Nation at Risk*, that students should be ready for college after satisfactory completion of a core curriculum? While additional courses beyond core appear to be necessary for college readiness for many students, in the long run this is neither a reasonable expectation nor a viable strategy.

Although academic achievement is just one aspect of college readiness, it is arguably the most important one. What is now clear is that taking the right *kind* of courses matters just as much as taking the right number of courses. The academic quality and intensity of the high school curriculum is a key determinant of success in postsecondary education (ACT, 2004a; ACT, 2005; Adelman, 2006).

¹ The ACT College Readiness Benchmarks are scores on the ACT® test that represent the level of achievement required for students to have a high probability of success in selected credit-bearing first-year college courses.

² Based on 647,298 high school students who took the ACT and indicated both that they had taken or planned to take the ACT-recommended core curriculum (see sidebar, p. 6) and that they would graduate from high school in 2006.

It is neither realistic nor justifiable to expect all high school students to take more and more courses to learn what they need to learn for college. The essential agenda is to improve the quality of core courses that *really* matter in preparing students for college and work.

An unfortunate reality is that the essential foundations in our educational system needed to support a rigorous core are lacking. Most state standards do not define rigorous outcomes at the course level, so teachers are not teaching to essential course outcomes and students aren't learning them (ACT & The Education Trust, 2004). In addition, most states do not require specific courses as prerequisites for high school graduation, thus providing insufficient direction to schools, teachers, students, or parents about what courses are important for graduation. Meanwhile, there is a persistent gap between postsecondary expectations and what high schools are teaching, and a perceptual gap in how college instructors and high school teachers view the preparedness of entering college students for college-level work. The lack of such crucial supports has a direct and dramatic impact on our students, whose chances at future success are hurt by the persistent gap between the high school experience and the more challenging requirements of postsecondary institutions.

In today's competitive global economy this gap can no longer be tolerated (Ohio Business Roundtable, 2006; Peter D. Hart Research Associates/Public Opinion Strategies, 2005). U.S. students must possess the knowledge and skills to be able to compete with workers in other countries, especially in high-growth fields (such as engineering and computer technology) that require a solid mathematics and science background. As we will see in the chapters that follow, without immediate improvements in educational standards, high school graduation requirements, teacher training, the alignment of elementary and secondary education with postsecondary expectations, and the vertical and horizontal alignment of high school courses, the gap between high school and postsecondary expectations may not only persist but grow larger.

So what can be done? The time has come to improve the quality of core courses so that all students have equal opportunities to become prepared for postsecondary education—whether in a two-year or four-year institution—and for work. The purposes of this report are to examine the gap between secondary and postsecondary education in the U.S. and to focus on successful strategies for eliminating this gap so that all high school graduates learn the essential skills they need to be successful in college and work.

It is time to reaffirm quality in the high school core curriculum.

1.

The Core Curriculum: An Unfulfilled Promise

Far too many students who take a core curriculum today are underprepared for the challenges of first-year college coursework.

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. But 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.

What do we mean by readiness for college? ACT uses the phrase to refer 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. 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, or a 50 percent chance of earning a B or better) in such credit-bearing first-year college courses as English Composition, Algebra, introductory social science, and Biology. The Benchmarks correspond to scores on the ACT English, Mathematics, Reading, and Science Tests, respectively.

Today we have empirical evidence that 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 a level of knowledge and skills comparable to that expected of the first-year college student (ACT, 2006c). College and work readiness should therefore be an expectation not only for traditional college-bound high school students, but for all students at the high school level.

EXPLORE and PLAN College Readiness Benchmarks: Earlier Progress Checks

ACT has also established College Readiness Benchmarks for EXPLORE® and PLAN®, the two additional components of ACT's Educational Planning and Assessment System (EPAS™). (See the Appendix for detailed information about EPAS.) These scores indicate whether students, based on their performance on EXPLORE (grade 8) or PLAN (grade 10), are on target to be ready for first-year college-level work when they graduate from high school.

Test	EXPLORE	PLAN	The ACT
English	13	15	18
Mathematics	17	19	22
Reading	15	17	21
Science	20	21	24

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 that basic skills have been acquired in the years preceding high school. For decades, ACT research has shown that students who take the minimum recommended number of core courses in a high school

ACT's Recommended Core Curriculum

- ▼ English: at least four years
- ▼ Mathematics: at least three years
- ▼ Social studies: at least three years
- ▼ Natural sciences: at least three years

subject area (four years of English, three years each of mathematics, science, and social studies) attain higher ACT scores than those students who take less than core. Figure 2 shows the average ACT scores of 2006 high school graduates who reported taking (or planning to take) the core curriculum compared to those who did not.

Students who take a minimum core curriculum also meet the ACT College Readiness Benchmarks in greater percentages than students who take less than core. As we saw in Figure 1 (p. 2), 26 percent of ACT-tested 2006 high school graduates who took core met all four College Readiness Benchmarks, 55 percent met one to three Benchmarks, and 19 percent met no Benchmarks. In comparison,

Ready for College and Ready for Work: Same or Different?

Results of a recent ACT study (ACT, 2006c) provide empirical evidence that, whether planning to enter college or workforce training programs after graduation, high school students need to be educated to a comparable level of readiness in reading and mathematics. Graduates need this level of readiness if they are to succeed in college-level courses without remediation and to enter workforce training programs ready to learn job-specific skills.

We reached this conclusion by:

- ▼ Identifying the level of reading and mathematics skills students need to be ready for entry-level jobs that require less than a bachelor's degree, pay a wage sufficient to support a family, and offer the potential for career advancement
- ▼ Comparing student performance on ACT tests that measure workforce readiness with those that measure college readiness
- ▼ Determining if the levels of performance needed for college and workforce readiness are the same or different

The study results convey an important message to U.S. high school educators and high school students: We should be educating all high school students according to a common academic expectation, one that prepares them for both postsecondary education and the workforce. Only then—whether they are among the two-thirds who enter college directly after graduation or those who enter workforce training programs—will they be ready for life after high school.

Although the contexts within which these expectations are taught and assessed may differ, the level of expectation for all students must be the same. Anything less will not give high school graduates the foundation of academic skills they will need to learn additional skills as their jobs change or as they change jobs throughout their careers. Opportunities for rigorous coursework should not be limited only to those students who have traditionally been considered most able to benefit from them. The results of this study provide ample evidence that we must move the agenda for high school redesign in a direction that will prepare all students for success, no matter which path they choose after graduation.

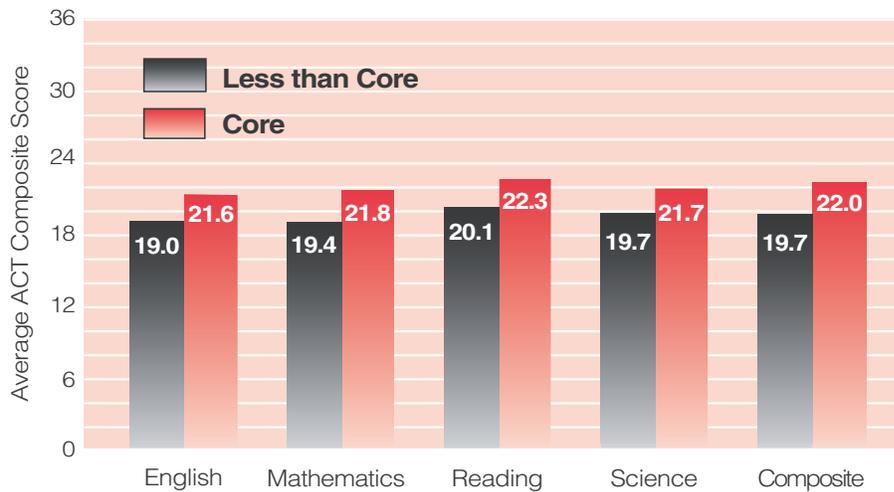


Figure 2: Average ACT Composite Scores for Students Taking and Not Taking the Core Curriculum (2006 High School Graduates)³

just 14 percent of ACT-tested 2006 high school graduates who did not take core met all four Benchmarks, 50 percent met one to three Benchmarks, and 36 percent met no Benchmarks.

However, if we look at ACT-tested 2006 high school graduates who took more than the recommended core (in other words, graduates who took core plus additional higher-level courses) we find both evidence of progress and signs of a troubling pattern. The evidence of progress is seen in all four subject areas (Figures 3 through 6), where the ACT College Readiness Benchmark attainment of graduates who took more than the minimum core is greater—sometimes substantially greater—than that of graduates who took only the core. In nearly all cases, Benchmark attainment increases as the number of additional beyond-core courses increases.

These positive results are also seen for low-achieving students who take these courses as well as for high-achieving students.⁴ Because students select the courses they take, student achievement associated with taking different numbers of courses reflects not only the contribution of course content but also the achievement level of the students who elect to take a particular number of courses. When student achievement level is controlled

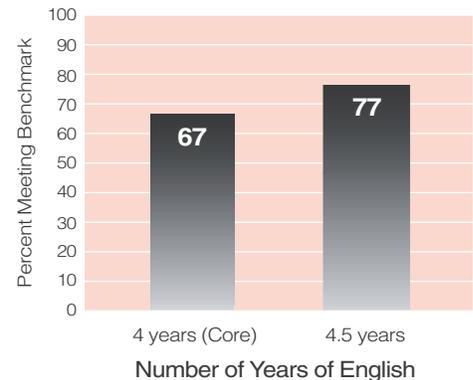


Figure 3: ACT College Readiness Benchmark Attainment by English Course Sequence (2006 High School Graduates)⁵

³ Based on 1,061,186 high school students who took the ACT and indicated that they would graduate from high school in 2006. ACT scores are reported on a scale from 1 to 36.

⁴ Two analyses were conducted, one using students with high school grade point averages of 0.00 to 2.99 (English: 247,365; Mathematics: 214,036; Social Studies: 212,775; Science: 185,910) and the other using students with high school grade point averages of 3.00 to 4.00 (English: 592,714; Mathematics: 568,649; Social Studies: 527,248; Science: 542,545).

⁵ Based on 940,780 high school students who took the ACT and indicated that they would graduate from high school in 2006.

using students' self-reported high school grade point average and grade level to more clearly isolate the effect of taking each number of courses, we found that, regardless of achievement level, students who took more than core coursework are substantially more likely to be ready for college than students who take only the core.

Yet the signs of a troubling pattern are also evident: even when students take substantial numbers of additional courses, no more than three-fourths of them are ready for first-year college coursework in mathematics, social science, or natural science. Only in English

The Core Curriculum: A Brief History

With rare exceptions such as the National Defense Education Act of 1958, a concerted attempt to make U.S. students competitive in science with students elsewhere in the world, the U.S. government before 1983 generally did not involve itself in educational matters beyond ensuring equal access or providing for students with special needs.

But in 1983, the National Commission on Excellence in Education published *A Nation at Risk: The Imperative for Educational Reform*. The commission, created in 1981 by Secretary of Education Terrel Bell, was charged with examining the quality of learning and teaching in U.S. schools—especially high schools—and recommending practical improvements. Among its recommendations, the commission called for

strengthening state and local high school graduation requirements, including establishing a minimum number of basic courses for all students as well as a slightly more ambitious curriculum for college-bound ones. In addition, they called for schools, colleges, and universities to “adopt more rigorous and measurable standards, and higher expectations, for academic performance and student conduct, and that four-year colleges and universities raise their requirements for admission.” (Vinovskis 2003, p. 120)

The commission identified the minimum number of basic courses as four years of English, three years of mathematics, three years of science, three years of social studies, and one-half year of computer science. Two years of a foreign language were also strongly recommended for the college bound (National Commission on Excellence in Education, 1983).

Before 1983, states had mandated that schools must provide certain minimal levels of courses, largely only to guarantee that the schools met state constitutional requirements for educational provision. But in the two decades since the publication of *A Nation at Risk*, nearly every state has made significant efforts to improve its education system. According to Fuhrman (2003), these efforts have come in roughly three stages: the excellence movement (from 1983 to about 1987), which emphasized increased core-course requirements and student assessments; the restructuring movement (from about 1987 to about 1990), which focused on improving school management; and the standards movement (from about 1990 to the present), which has dealt with creating substantive expectations for what students should know and be able to do in each core subject area.

Although the first two stages produced few if any improvements in student achievement (Finn, Jr., 1991; Fuhrman, 2003; Toch, 1991; Vinovskis, 2003), the standards movement has fared somewhat better, particularly in mathematics (Fuhrman, 2003). However, much of the work of this movement remains incomplete. Fuhrman (2003) writes:

Curricular improvement was never as widespread as hoped; policymakers left developing curriculum tied to standards up to schools rather than investing deliberately in it. Moreover, the standards often were vague, too vague to guide decisions about specific curricula . . . (p. 11)

Weak standards and a lack of challenging curricula: to a great extent, this is the world that U.S. high school students still live in today.

(Figure 3) does the percentage of students who are ready for college-level work after taking additional courses in high school exceed 75 percent.

Of those students who take a core mathematics curriculum, only 16 percent are ready for a credit-bearing first-year College Algebra course (see Figure 4). It is not until students take one full year of additional mathematics courses beyond the core that we see more than half (62 percent) of ACT-tested students ready for college-level work in mathematics.

In social studies (Figure 5), 50 percent of students who take a core curriculum are ready for an introductory college social science course. This percentage increases to 60 percent for students taking one-and-a-half years of additional higher-level social studies courses in high school.

In science (Figure 6), 26 percent of students taking the science core are ready for a credit-bearing college Biology course; although this percentage rises to 38 for students taking an additional year of science, that still leaves more than 6 students in 10 who are not ready for college-level science after having taken four years of science in high school. So even taking additional higher-level coursework in high school does not lead to increased college readiness for many students.

Why should so many students who take a core curriculum in high school be unprepared for the challenges of first-year college coursework? Why should it be necessary for

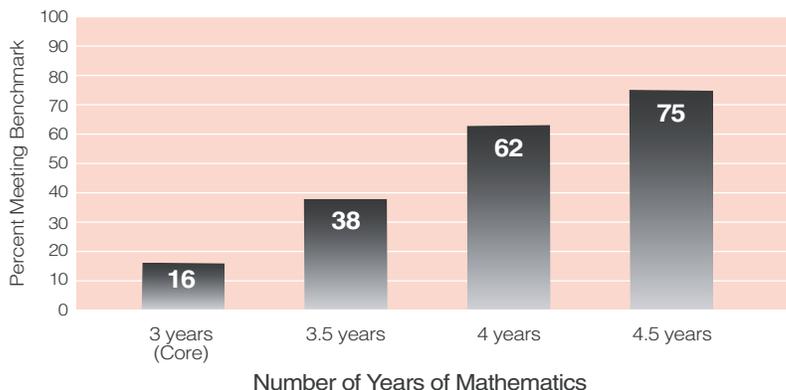


Figure 4: ACT College Mathematics Benchmark Attainment by Mathematics Course Sequence (2006 High School Graduates)⁶

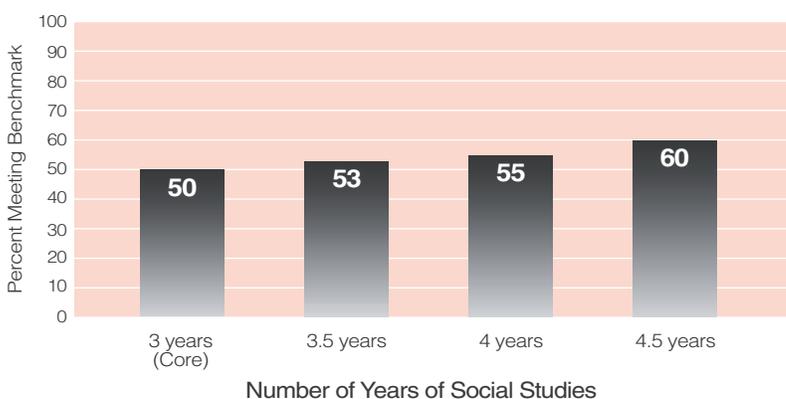


Figure 5: ACT College Reading Benchmark Attainment by Social Studies Course Sequence (2006 High School Graduates)⁷

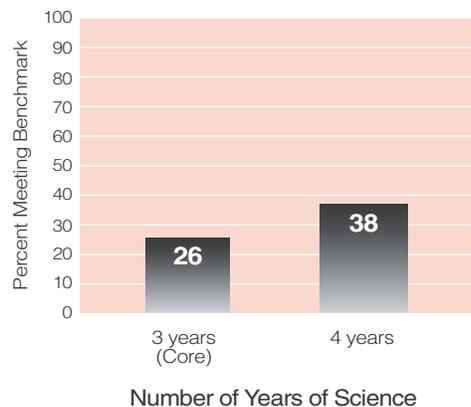


Figure 6: ACT College Science Benchmark Attainment by Science Course Sequence (2006 High School Graduates)⁸

⁶ Based on 872,949 high school students who took the ACT and indicated that they would graduate from high school in 2006.

⁷ Based on 822,620 high school students who took the ACT and indicated that they would graduate from high school in 2006.

⁸ Based on 808,359 high school students who took the ACT and indicated that they would graduate from high school in 2006.

students to take additional courses beyond the core in order to prepare for credit-bearing first-year college courses? And why should so many of even these students still graduate unprepared? Perhaps the underlying reason is that high school core courses lack rigor and are simply not focused on the essential outcomes that postsecondary institutions want their entering students to know and be able to do. Should it not still be our expectation today—as it was for the authors of *A Nation at Risk*—that students who satisfactorily complete a core curriculum be ready for college?

Rigor and Remediation

Insufficient course rigor increases burdens on students, colleges, and taxpayers.

If the goal of high school is to prepare all students for some type of postsecondary education (whether it be a four-year college or university, a two-year community college, or a targeted workforce training program), then it should be clear that the high school curriculum must address the academic demands these forms of postsecondary education make on high school graduates. A rigorous high school core curriculum must above all teach students the essential knowledge and skills needed for success in postsecondary education.

However, because too few graduates are learning these essentials, many of them are taking remedial courses in college, resulting in estimated nationwide expenditures of \$1.4 billion for tuition and other costs at community colleges alone (Alliance for Excellent Education, 2006). Figure 7 shows by mathematics course sequence the percentages of ACT-tested high school graduates in three states from 1993 through 2004 who took remedial mathematics courses during their first year of college. Note that while 26 percent of the graduates who took or planned to take Algebra I, Algebra II, and Geometry in high school took remedial mathematics courses in college, as many as 17 percent who had taken an additional higher-level mathematics course beyond these three also needed remediation.

The need for such remedial coursework is a problem not just for students and colleges but for society at large. According to the Alliance for Excellent Education (2006), “Community colleges already bear the greatest share of the remediation burden, and trends indicate that their responsibilities in this arena are likely to grow” (p. 2). And because state and local governments provide subsidies to many community colleges on top of the tax monies already allocated to their high

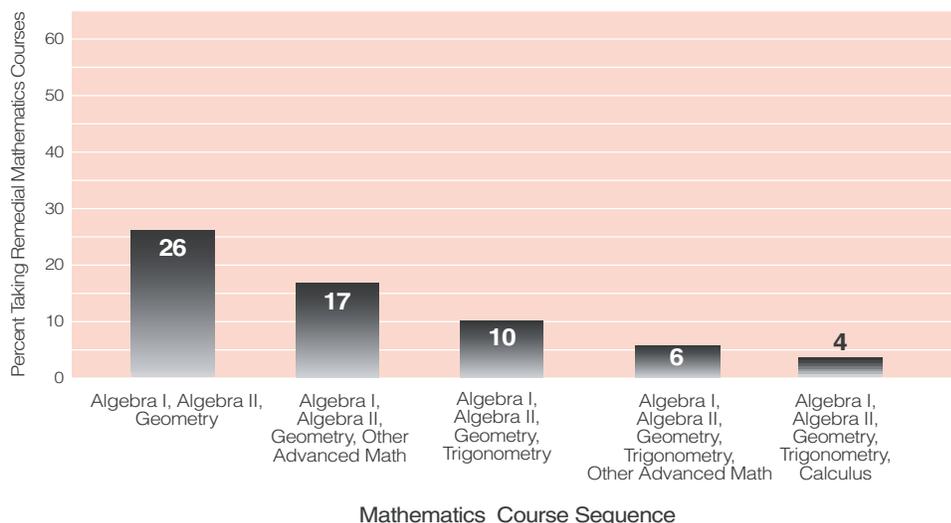


Figure 7: Percentages of ACT-tested High School Graduates in Three States Taking Remedial Mathematics Coursework during Their First Year of College, by Mathematics Course Sequence (1993–2004)⁹

schools, “taxpayers are essentially paying twice for the coursework and skill development students are expected to receive in high school” (p. 3). If postsecondary remediation rates continue to increase as predicted, then it is even more incumbent upon high schools to provide students with the rigorous education they deserve.

Preparing High School Students for College: The Failure Rate Is Exceeding the Success Rate

While some students make progress toward college readiness in high school, a larger percentage of students are actually failing to meet ACT’s College Readiness Benchmarks.

Another symptom of the lack of rigor in high school is that students are actually losing momentum in progress toward college readiness during the high school years. We examined student progress from eighth to tenth to twelfth grade by studying students in three consecutive graduating classes who were tested using all three components of ACT’s Educational Planning and Assessment System (EPAS): EXPLORE, PLAN, and the ACT. In this way, the actual progress students make as they take each program during their passage from junior high to high school graduation can be evaluated. Figure 8 shows the change from one

⁹ Based on 81,574 high school students in three states who took the ACT between 1992–1993 and 2003–2004 and indicated that they would graduate from high school during the relevant year, and who, according to data from institutions participating in ACT’s College Success Profile Service, took remedial coursework during their first year of college.

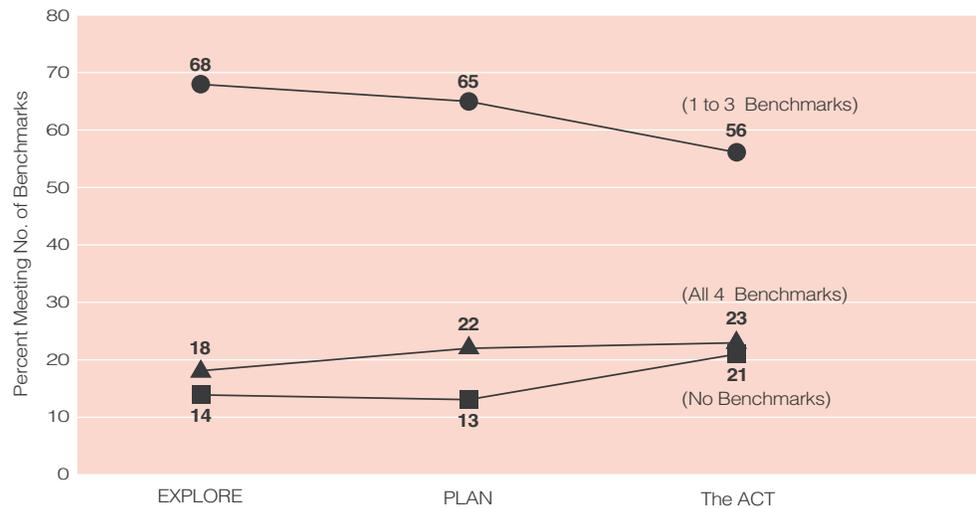


Figure 8: College Readiness Benchmark Attainment in Grades 8, 10, and 12 for EPAS-tested Students, by Number of Benchmarks Attained (High School Graduating Classes of 2003 through 2005)¹⁰

program to the next in the distribution of students who met none, one to three, or all four College Readiness Benchmarks associated with each program.

While there is a slow but steady increase in the percentages of students meeting all four Benchmarks (from 18 to 23 percent), there is also a net increase in the percentages of students meeting *no* Benchmarks—with all of the increase occurring between tenth and twelfth grades (from 13 to 21 percent). There is also a fairly rapid decline in the percentage of students meeting one to three Benchmarks (from 68 to 56 percent). The rate of decline of the percentage of students meeting some of the Benchmarks (12 percentage points from EXPLORE to the ACT) is more rapid than the rate of increase in students who have become fully ready for college (five percentage points from EXPLORE to the ACT). And there is a seven percentage-point increase in students who are *no longer on target* to be ready for college at all. These statistics reveal that the rate of failure is exceeding the rate of success when it comes to preparing high school students for college. And this does not account for students who have dropped out of high school along the way.

¹⁰ Based on 284,898 students who took all three EPAS programs and indicated that they would graduate from high school in 2003, 2004, or 2005.

Students are Losing Momentum in Grades 11 and 12

Much of the loss of momentum appears to be occurring during the last two years of high school.

Figure 9 shows College Readiness Benchmark attainment by subject area for students who took all three EPAS programs and graduated from high school in 2003, 2004, or 2005.

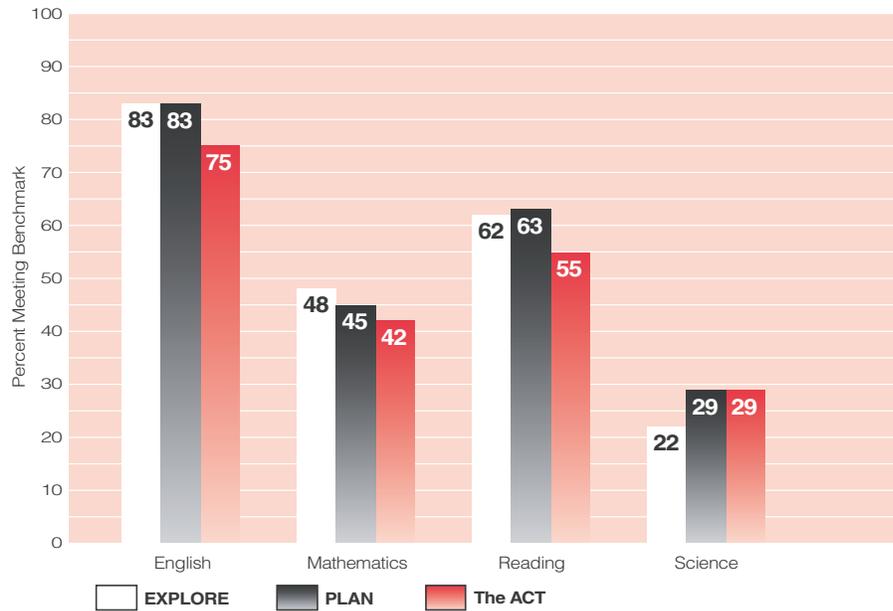


Figure 9: College Readiness Benchmark Attainment in Grades 8, 10, and 12 for EPAS-tested Students (High School Graduating Classes of 2003–2005)¹¹

In English, momentum toward college readiness remained stable between grades 8 and 10, and then declined substantially between grades 10 and 12. In Mathematics, momentum toward college readiness declined steadily from grade 8 to grade 12. In Reading, momentum toward college readiness increased slightly between grades 8 and 10, and then declined substantially between grades 10 and 12. In Science, momentum toward college readiness increased between grades 8 and 10, but leveled off between grades 10 and 12.

In three out of four high school subject areas, levels of potential college readiness either achieved or sustained in tenth grade are being more than offset by losses in momentum toward college

¹¹ Based on 284,898 students who took all three EPAS programs and indicated that they would graduate from high school in 2003, 2004, or 2005.

readiness between grades 10 and 12. Only in Science are proportionally more students ready for college-level work than were on target to be ready when they entered high school.

Summary

There appears to be substantial evidence that, in too many high schools, taking the right number of core courses is failing to prepare students for college and work. Of those ACT-tested 2006 high school graduates who took a core curriculum, only 26 percent were ready for credit-bearing entry-level college coursework in all four subject areas. Many of the remaining students will likely need to take one or more remedial courses in college.

Of those graduates who took more than a core curriculum, only 62 percent are ready for college-level mathematics coursework after having taken an additional year of mathematics in high school, while just 38 percent are ready for college-level science coursework after taking an additional year of science. In mathematics, at least one additional year of coursework is required to meet the modest goal of preparing even half of high school graduates for entry-level college courses; in science, not a single course sequence tracked by ACT produced more than 45 percent of students who are ready for college-level science (ACT, 2006a). Only in English are we seeing the core curriculum alone preparing a majority of graduates for their first year of college coursework.

We also see a strong trend that students are losing momentum in progress toward college readiness during high school, and that this loss of momentum appears to be occurring most dramatically in grades 11 and 12.

In the next chapter, we examine the critical role that alignment plays in helping students graduate from high school ready for college. Specifically, we examine the need to align the essentials necessary for college readiness—state standards, graduation requirements, core course standards, teaching, and assessment—if we are to fulfill the expectation, expressed in *A Nation at Risk*, that all high school graduates who satisfactorily complete a core curriculum are ready for college.

2.

A Rigorous Core: Aligning the Essentials

The rigor of core courses is at risk in today's high schools unless we align a number of the essentials for college readiness: state standards, diploma requirements, core course standards, teaching, and assessment.

The U.S. has always counted on the public school system to educate its children in a manner that will best prepare them for their future. For the most part, public schools have a clear sense of their mission and are actively committed to educating all of their students. But today it appears that some of the essentials for college readiness are victims of misalignments in the system that actually work against the goal of ensuring rigor in the core curriculum. In this chapter, as a first step toward reaffirming quality in the high school core curriculum, we examine these misalignments.

MISALIGNMENT: Diploma Requirements Often Do Not Specify Core Courses

More than half the states do not require students to take specific core courses in mathematics or science in order to graduate from high school.

One of the barriers to ensuring that all students take courses of sufficient rigor is that not enough states require that certain rigorous courses be taken as prerequisites to high school graduation. Weak diploma requirements often result in students not taking the courses they need in order to be ready for college or work when they graduate from high school.

We examined state diploma requirements either currently in effect or scheduled to be implemented within the next two years. Table 1 summarizes the results of this investigation.

Just over half the 50 states require students to take any mathematics courses at all in order to graduate. Of these 26 states, 12 require Algebra II, and only four states require any mathematics beyond Algebra II. ACT research has shown that Algebra II has a substantial impact on student readiness for college (ACT, 2004a).

Table 1: Current or Planned State Diploma Requirements in Mathematics and Science (As of August 2006)

	Mathematics			Science			
	Any (includes Algebra II and beyond)	Algebra II	Beyond Algebra II	Any (includes Biology, Chemistry, and Physics)	Biology	Chemistry	Physics
No. (%) of States Requiring Course	26 (52%)	12 (24%)	4 (8%)	30 (60%)	17 to 21 (34% to 42%)*	1 to 5 (2% to 10%)*	2 to 6 (10% to 12%)*

* Includes four states in which students select from among a group of required courses.

In science, while 30 of the 50 states require at least one course for graduation, only 17 explicitly require Biology, one explicitly requires Chemistry, and two explicitly require Physics. Four additional states offer students a group of required courses from which to select, but in these states a student could still avoid taking two or even all three of the aforementioned science courses. It is clear, therefore, that even today more than half of the states do not specify particular core courses in either mathematics or science, even though these courses have been shown to have a dramatic impact on college readiness.

The ACT National Curriculum Survey®

All three components of EPAS (EXPLORE, PLAN, and the ACT) measure achievement because each is firmly based in the curriculum of the grade level for which it is intended. Every three to four years, we conduct our National Curriculum Survey (ACT, 2007a), in which we ask more than 20,000 educators nationwide across grades 7–14 to identify the knowledge and skills that are important for students to know to be ready for first-year college-level work. We examine the objectives for instruction in grades 7 through 12 for all states that have published such objectives. 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.

MISALIGNMENT: Lack of Alignment between Secondary and Postsecondary Educators' Expectations

High school teachers and college faculty disagree about how well state standards are preparing students for college.

The most recent National Curriculum Survey (ACT, 2007a) suggests that high school and college faculty disagree about the role that state standards are playing in preparing students for college. We surveyed thousands of secondary and postsecondary educators nationwide, asking them various questions about the courses they teach, the academic achievement of the students who take their courses, and aspects of the educational climate in their state.

One major finding of the survey is that secondary and postsecondary educators differ greatly in how well they believe their state's standards prepare students for college-level work in the content area in which they teach. Figure 10 shows

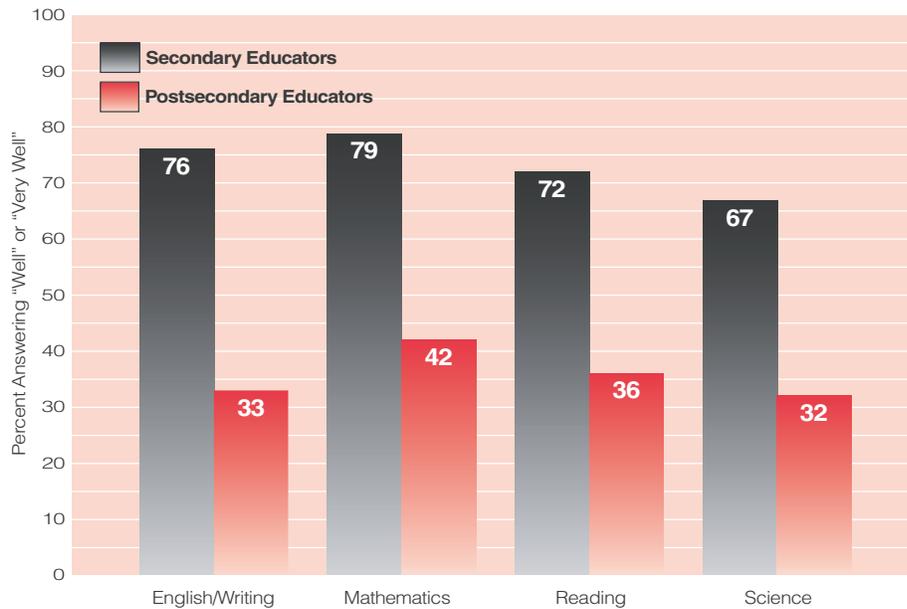


Figure 10: Percentages of Secondary and Postsecondary Instructors Answering “Well” or “Very Well” to the Question “How well do you think your state’s standards prepare students for college-level work in your content area?”¹²

Note: This figure is adapted from *ACT National Curriculum Survey 2005–2006*, by ACT, Inc., 2007, Iowa City, IA: Author.

the percentages of secondary and postsecondary educators who answered this question “Well” or “Very Well” in the four content areas covered by the ACT.

Postsecondary educators were about half as likely as secondary educators to assert that state standards prepared students for college-level work. Similarly, almost two-thirds of the postsecondary instructors we surveyed responded that state standards prepared students “Poorly” or “Very Poorly” for college-level work (ACT, 2007a).

High school teachers and college faculty also disagree about the depth and breadth of essential state standards needed to prepare students for college.

A second major point of difference between secondary and postsecondary instructors is that high school teachers rated a much larger number of topics and skills as being “important” or “very important” for college success than did college instructors. This parallels the tendency of many state standards to be broad and inclusive rather than specific and selective (Finn, Jr., Julian, & Petrilli, 2006). It may be that the extensive nature of state standards forces

¹² Based on responses from 2,054 secondary instructors (363 English/Writing, 282 Mathematics, 305 Reading, and 1,104 Science) and 2,880 postsecondary instructors (401 English/Writing, 455 Mathematics, 401 Reading, and 1,623 Science) who participated in ACT’s National Curriculum Survey in 2005–2006.

high school teachers to treat all topics as important, potentially sacrificing depth for breadth. In contrast, the postsecondary educators we surveyed indicated that a more rigorous treatment of *fundamental* content knowledge and skills would better prepare students for college and work.

So while a majority of secondary educators look favorably upon the impact of state standards on student preparation, a majority of postsecondary educators look upon this impact unfavorably. And where high school teachers give equal emphasis to numerous content topics

In almost no state is there consensus across the two systems on the courses students should take in high school. . . . [I]n most states, even students who follow all the rules have no guarantee of meeting postsecondary education's course requirements.

—Somerville & Yi, 2002

and skills, college instructors believe that a more thorough study of fewer but essential content and skills is a better foundation for postsecondary success. These disagreements point to a fundamental gap between the secondary and postsecondary education systems in this country. If high school teachers believe they are preparing their students for college, but these students do not in fact possess the essential skills deemed

necessary for success in postsecondary education, then our high school graduates are not being well served by the very institutions whose mission is to help them succeed.

MISALIGNMENT: State Standards Do Not Define Essential Course-Level Outcomes

Too often, state standards do not prescribe specific essential outcomes at the course level.

What role do state standards play in helping to define the rigorous course outcomes that students should achieve upon successful completion of a course?

Ideally, state standards should delineate what students ought to know and be able to do in their high school courses in each subject area so that students have a solid foundation on which to begin the next course in the sequence. However, only a minority of states—21 in language arts, 19 in mathematics, and 17 in science—have course-level standards in grades 9 through 12. And even in states whose standards are considered the best in the nation (Finn, Jr., Julian, & Petrilli, 2006), the knowledge and skills needed for college readiness are commonly absent from course-level standards. Table 2 provides a partial list of these missing standards. The table was compiled by comparing course outcomes that postsecondary educators identified as essential with the course-level standards in three states that have been rated highly on the quality of their state education standards.

Table 2: Rigorous Outcomes Commonly Missing from Course-level State Standards in English, Mathematics, and Science

Course	Course Outcome
English 10	<p>Recognize that several correct punctuation choices create different effects (e.g., joining two independent clauses in a variety of ways)</p> <p>Use close-reading strategies (e.g., visualizing, annotating, questioning) in order to interpret increasingly challenging texts</p> <p>Read literary criticism, with assistance, to increase comprehension of increasingly challenging literary texts</p>
Algebra II	<p>Solve compound inequalities containing “and” and “or” and graph the solution set</p> <p>Rationalize denominators containing radicals and find the simplest common denominator</p> <p>Solve problems involving conditional probability</p>
Biology I	<p>Explain the functions of unique plant structures, including the cell wall, chloroplasts, and critical parts of the flower and the seed</p> <p>Describe the mode of inheritance in commonly inherited disorders (e.g., sickle cell anemia, Down syndrome, Turner’s syndrome, PKU)</p> <p>Describe the function of enzymes, including how enzyme-substrate specificity works, in biochemical reactions</p>

Even a cursory examination of the highest-rated state standards that exist today reveals that not all of the course outcomes identified as essential by postsecondary instructors are covered in state standards documents. More work is needed on the part of states to specify and to disseminate to classroom teachers in instructional terms the course outcomes that are essential for college readiness.

MISALIGNMENT: Lack of Readiness for High School

Many eighth-graders begin high school without the knowledge and skills they need to succeed there.

Granting that the academic quality and intensity of one’s high school curriculum is a key determinant of postsecondary success, there is no assurance that either the standards of secondary school performance, content coverage, or challenge of the material will come close to the threshold demands of either four-year or community colleges.

—Adelman, 2006

Preparation and readiness affect not only the transition between high school and college but also the transition between junior high and high school. One reason that improving college readiness is such a challenge for high schools is because many eighth-graders enter high school without having learned the skills needed to perform well

in high school. In a recent ACT survey (ACT, 2007c), teachers of entering high school students reported spending from about one-fourth to about one-third of their time in the classroom re-teaching skills that should have been learned prior to high school (Table 3).

Table 3: Percentage of High School Classroom Time Spent Re-teaching Prerequisite Entry-level Skills in English, Mathematics, and Science¹³

High School Course	Percent of Time Spent Re-teaching
English 9	32
Algebra I	24
Biology I	23

Course requirements have limitations. Just because a course is labeled Algebra I doesn't always mean that it teaches the right content. Often times, the algebra students learn in courses with the same name doesn't necessarily match with what colleges and businesses expect.

—Somerville & Yi, 2002

[I]n some high schools, 'precalculus' on a transcript could mean any mathematics prior to calculus, including Algebra I.

—Adelman, 2006

When we examine the percentages of EXPLORE-tested eighth-graders who did not meet the EXPLORE College Readiness Benchmarks, we also see evidence of a lack of readiness for high school. Figure 11 gives these percentages for a cohort of eighth-grade students who took all three EPAS programs and graduated from high school between 2002 and 2005.

Depending on the subject area, anywhere from one in six to nearly eight in ten of these EXPLORE-tested students were not on target to be ready for college by the time they graduated from high school. (The percentages were even lower for African American students, Hispanic students, and

students whose annual family income is less than \$30,000.) And with the exception of Science, the percentages of these EXPLORE-tested students who later did not meet the College Readiness Benchmarks for the ACT are even higher (26 percent in English, 58 percent in Mathematics, 45 percent in Reading, and 71 percent in Science). Not surprisingly, students who are not prepared for high school are even less likely to be prepared for college by the time they graduate from high school. It is important that high school readiness expectations be vertically aligned with college readiness expectations so that students who lack foundational skills for high school work can be identified earlier and their weaknesses remediated.

¹³ Based on survey responses from 502 teachers of English 9, 613 teachers of Algebra I, and 657 teachers of Biology I.

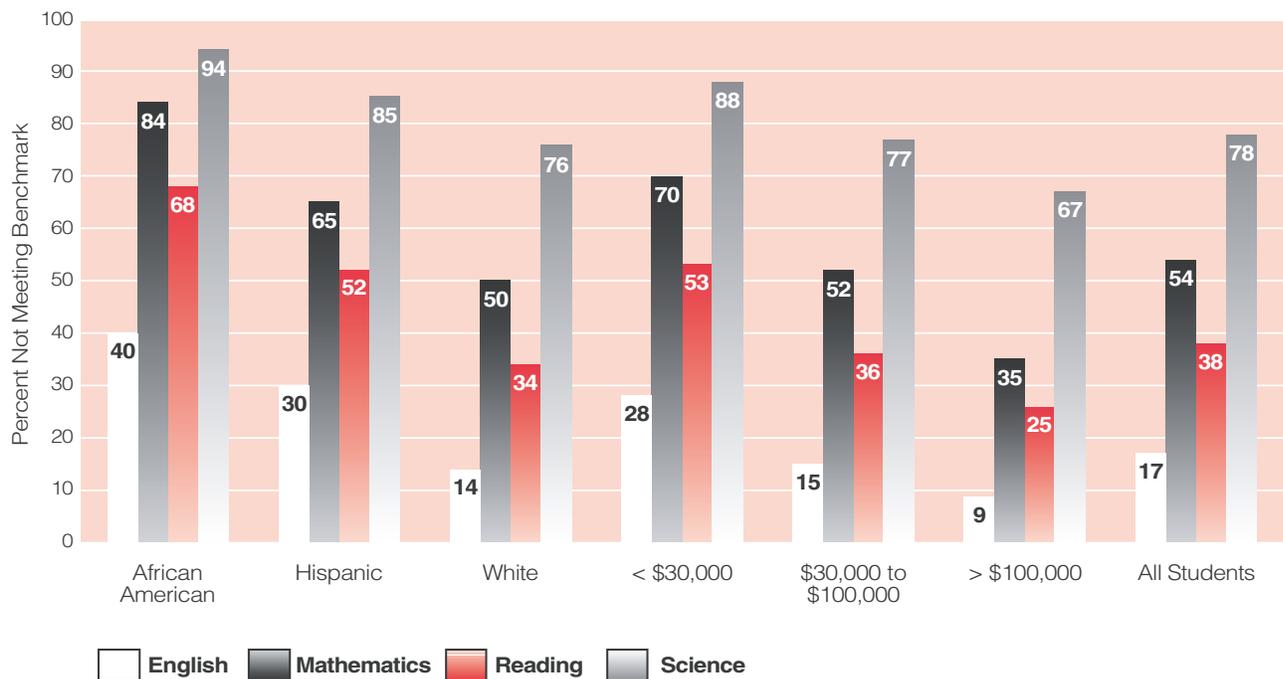


Figure 11: Percentages of EXPLORE-tested Students Not Meeting EXPLORE College Readiness Benchmarks, by Selected Racial/Ethnic Group and Annual Family Income (High School Graduating Classes of 2002–2005)¹⁴

MISALIGNMENT: High School Course Grades Are Sending Mixed Messages

Students who earn good grades in their high school courses are led to believe they are ready for college; unfortunately, many are not.

Many high school graduates who earn good grades in high school courses—taken either as part of or in addition to a core curriculum—are not necessarily ready for college either. As we saw in Figures 3 through 6, in which the highest level of ACT College Readiness Benchmark attainment in each subject area ranges from 38 percent to 77 percent, about one-fourth to nearly two-thirds of ACT-tested graduates who take higher-level courses beyond core have not demonstrated a capacity to handle first-year college-level work in at least one subject area. Ironically, however, many students are receiving high grades in their high school courses, leading them to believe they are ready for college. Are course grades giving students and their parents mixed messages about college readiness?

¹⁴ Based on 353,868 students who took EXPLORE between 1998 and 2001, PLAN between 2000 and 2003, and the ACT between 2002 and 2005.

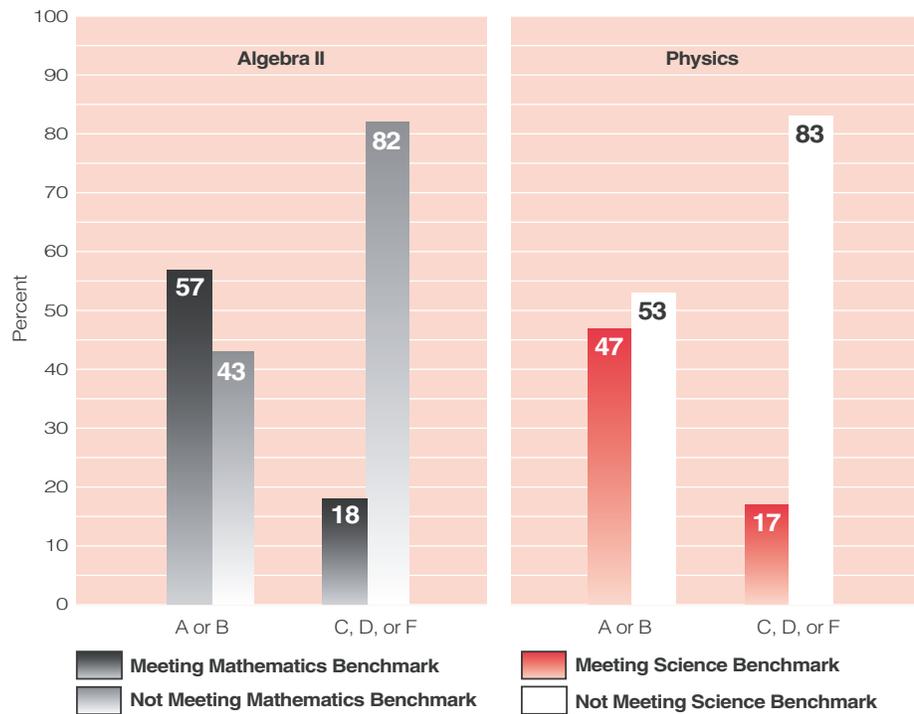


Figure 12: ACT College Readiness Benchmark Attainment by Course Grade (2005 High School Graduates)¹⁵

Figure 12 compares the course grades that ACT-tested 2005 high school graduates earned in Algebra II and Physics to their success at meeting the ACT College Readiness Benchmarks in Mathematics and Science, respectively.

Nearly half of ACT-tested 2005 high school graduates who earned a grade of A or B in high school Algebra II did not meet the ACT College Readiness Benchmark for Mathematics, and more than half of the graduates who earned a grade of A or B in high school Physics did not meet the ACT College Readiness Benchmark for Science. How can 43 percent of the students who received an A or B in Algebra II not be ready for college Algebra? Whether as a result of grade inflation or a lack of challenging course content, it is clear that course grades are not accurately reflecting what is needed to meet the challenges of a college education. It is time for state standards to define essential course outcomes so that teachers can teach to these outcomes and student grades can more accurately reflect how well students are learning the knowledge and skills that are necessary for college readiness.

¹⁵ Based on 764,348 (Algebra II) and 204,139 (Physics) high school students who took the ACT and indicated that they would graduate from high school in 2005.

MISALIGNMENT: Highly Qualified Teachers Are Not Being Assigned to the Students Who Need Them Most

Teacher quality has a huge impact on high school students' readiness for college.

Another important contributor to the rigor of the high school core curriculum is teacher quality. According to recent research (ACT, 2007c), one way in which teacher quality can affect student learning is that, on average, teachers of lower-level courses are less experienced than teachers of upper-level courses.

Another way in which students' academic momentum can be stymied is by assigning teachers to courses that they are not professionally qualified to teach or not yet experienced enough to teach well. In fact, there is evidence that these teachers are most often assigned to those students who are furthest behind and who consequently need the most help. A recent study demonstrates the extent of the situation (Peske & Haycock, 2006):

- ▼ Despite clear evidence that student achievement is closely linked to the degree of teaching experience their teachers possess, students in high-poverty and high-minority schools are disproportionately assigned to teachers who are new to the profession.
- ▼ Despite research showing that teachers with a major in the subject they teach routinely elicit higher student performance than teachers without such a major, teachers in high-poverty and high-minority secondary schools are more likely to be lacking a major—or even a minor—in the subject they teach.
- ▼ The effect of these two conditions is an increase in the disparity between the academic achievement of students who attend high-poverty and high-minority schools and that of students who attend other schools.

Presley and Gong (2005) studied the relationship at Illinois high schools between average teacher quality (a measure including both academic qualification and degree of experience, and which is highly correlated with other school characteristics such as percentage of students at or below the poverty level and percentage of students who are members of racial/ethnic minority groups) and student course-taking patterns in mathematics in those schools. This research revealed a direct relationship between teacher quality and students' degree of college readiness as determined by an index based on their ACT scores and high school grade point averages (Figure 13).

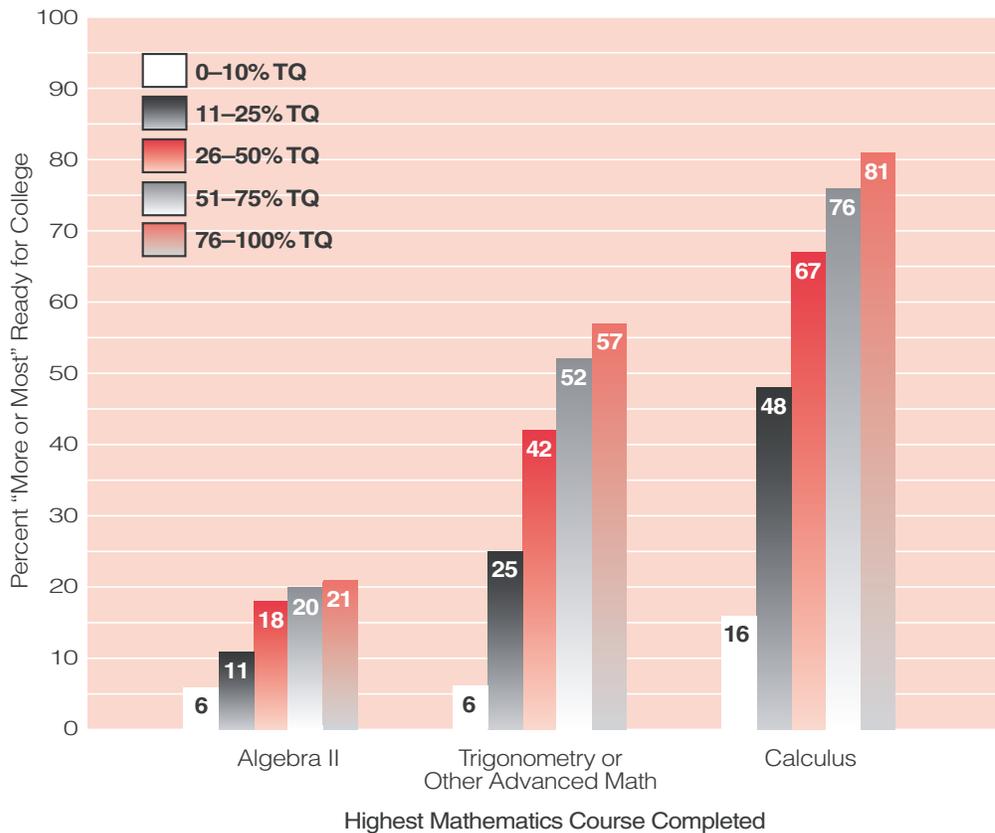


Figure 13: Student College Readiness by School Teacher Quality (TQ) and Highest Mathematics Course Taken (Illinois 2001 Public High School Juniors)

Note: This figure is adapted from *The Demographics and Academics of College Readiness in Illinois* (Policy Research Report No. IERC 2005-3), by J. P. Presley and Y. Gong, 2005, Edwardsville, IL: Illinois Education Research Council.

The figure shows, for example, that students whose highest level of mathematics course completed was Algebra II and who attended schools with an average teacher quality index in the second quartile (26 to 50 percent) were more ready for college than students whose highest level of mathematics course completed was Calculus but who attended schools with a teacher quality index of only zero to 10 percent (Peske & Haycock, 2006). Overall, lower-level mathematics courses at schools with higher teacher quality benefit students more than do the same courses at schools with lower teacher quality.

Teachers make a big difference in students' chances of becoming ready for college. Schools need to determine whether they are assigning the right teachers to the right core courses—and to the students who need them most.

Summary

Realigning and clarifying the essential elements of our K–16 education system will help to reaffirm the rigor of the core curriculum. In comparing secondary and postsecondary educators' expectations, we see radically different views about the impact of state standards on the level of preparation of today's students. We see postsecondary instructors expecting more depth in student knowledge and understanding of fewer (but essential) state standards rather than the broad coverage of numerous state standards that high school teachers currently believe they are obligated to teach. These expectations should be realigned.

We also see more than half the states silent on the specific courses that high school students should be required to take in order to graduate. Until state graduation requirements define the right set of courses needed for success in higher education, students will continue taking courses that may or may not contribute to readiness. And issues regarding teacher quality and course grades also illustrate additional needs for realignment, not only in the assignment of high-quality teachers to teach rigorous high school core courses, but in grading practices that are more in line with postsecondary expectations.

Although the focus of this report is on college readiness, there is an equally critical parallel issue: the lack of readiness for high school. There is no question that we will not solve the college readiness issue without also addressing the high school readiness issue. Every day we see evidence of the lack of readiness for high school, such as the high proportion (as much as one-third) of ninth-grade class time that teachers report spending on re-teaching skills that students should have learned prior to entering high school. Aligning the expectations for high school readiness with college readiness is a necessary prerequisite for long-term success.

However, as is currently being demonstrated in numerous high-performing high schools across the nation, these alignment challenges can be overcome. Let's examine the differences high-performing schools have made in the college readiness of their graduates.

3.

The Impact of Rigor: Real Evidence of Progress

A study of nearly 400 U.S. high schools shows that core courses can be made rigorous and that rigorous content can be effectively taught and learned.

Despite obstacles to preparing high school students for postsecondary education and workforce training programs, there are schools that are succeeding. These schools are currently offering elements of a rigorous core curriculum that are resulting in improved student achievement and improved readiness for college. If we

Beating the Odds

Do improvements in the high school core curriculum make a difference? Evidence shows that the answer is a definite yes. Many schools across the U.S. are beating the odds by preparing substantial numbers of students for college, even in high-poverty, high-minority districts (ACT & The Education Trust, 2004). We recently studied two high-poverty, high-minority schools whose core curricula strongly emphasize the importance of college readiness. At both schools, increases were seen in the percentage of students taking the core curriculum and in the percentages of students meeting the ACT College Readiness Benchmarks (ACT, 2007b). Another high school we studied showed substantial improvements in student achievement after implementing a more rigorous core curriculum (ACT, 2004b).

believe that more students will be ready for college if they are prepared for and have the opportunity to take a rigorous core curriculum in high school, it may be beneficial to take a look at those schools whose students are doing so already.

ACT analyzed nearly 400 schools across the United States that have recently shown greater-than-average increases in ACT Mathematics or Science Test scores. These increases are all associated with substantial numbers of students taking course sequences that include rigorous courses in mathematics and science (Algebra II and Chemistry, respectively).

Figures 14 and 15 report the benefits to students when they have the opportunity to take rigorous key core courses. On average,

students from rigorous schools who took Algebra II improved their ACT Mathematics Test scores 4.2 points (21.6 vs. 17.4), while all ACT-tested students who took Algebra II improved their scores 2.1 points (19.1 vs. 17.0). In Science, students from rigorous schools who took Chemistry improved their ACT Science Test scores 4.0 points (22.3 vs. 18.3), while all ACT-tested students who took Chemistry improved their scores 2.4 points (21.0 vs. 18.6).

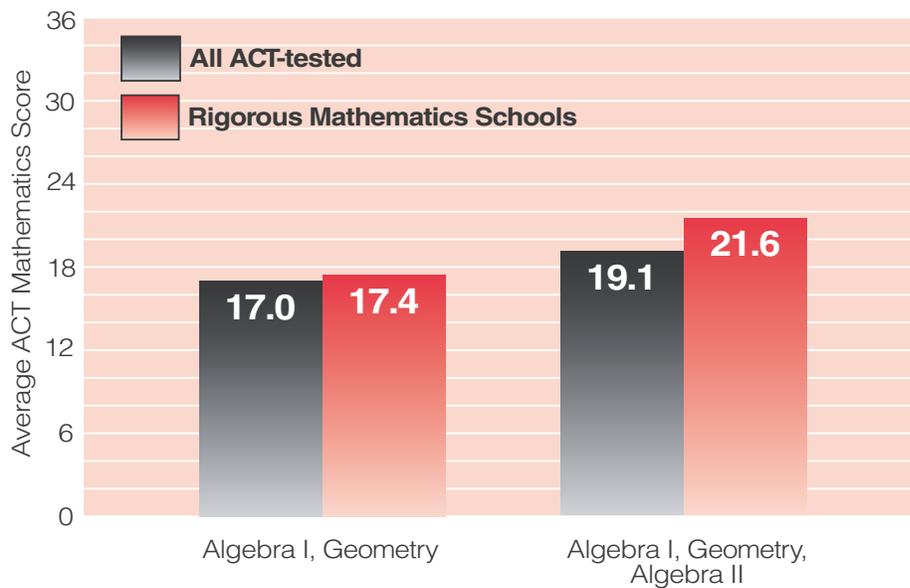


Figure 14: Average ACT Mathematics Test Scores for Students Taking Algebra I, Geometry, and Algebra II vs. Students Taking Algebra I and Geometry Only (ACT-tested 2004 High School Graduates, ACT-tested 2004 Graduates of Rigorous Mathematics High Schools)¹⁶

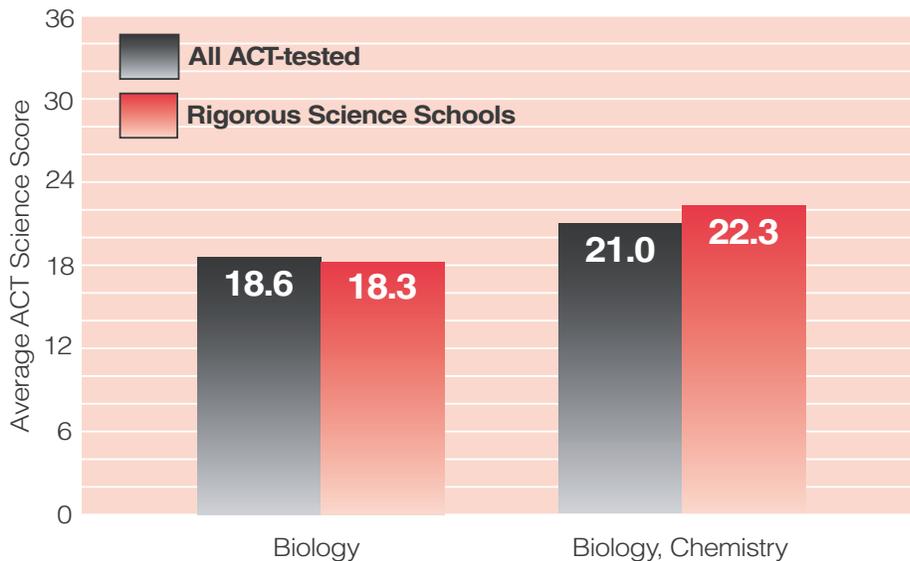


Figure 15: Average ACT Science Test Scores for Students Taking Biology and Chemistry vs. Students Taking Biology Only (ACT-tested 2004 High School Graduates, ACT-tested 2004 Graduates of Rigorous Science High Schools)¹⁷

¹⁶ Based on 518,221 (All ACT-tested) and 34,193 (Rigorous Mathematics Schools) high school students who took the ACT and indicated that they would graduate from high school in 2004.

¹⁷ Based on 715,809 (All ACT-tested) and 40,210 (Rigorous Science Schools) high school students who took the ACT and indicated that they would graduate from high school in 2004.

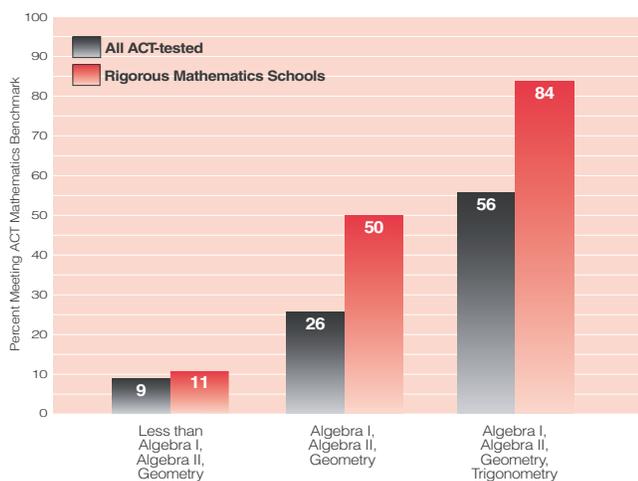


Figure 16: ACT Mathematics Benchmark Attainment, by Mathematics Course Sequence (ACT-tested 2004 High School Graduates, ACT-tested 2004 Graduates of Rigorous Mathematics High Schools)¹⁸

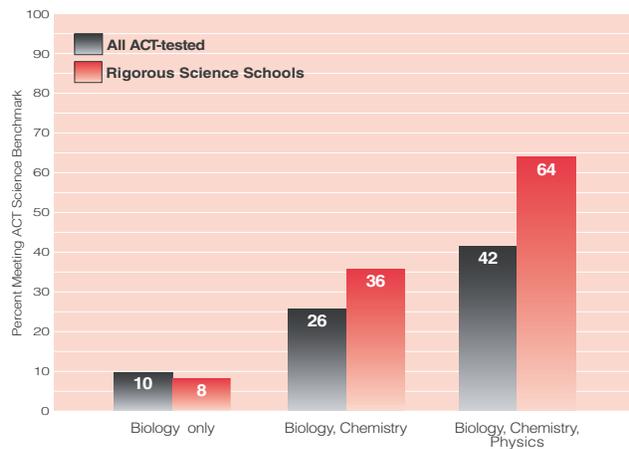


Figure 17: ACT Science Benchmark Attainment, by Science Course Sequence (ACT-tested 2004 High School Graduates, ACT-tested 2004 Graduates of Rigorous Science High Schools)¹⁹

Students who took Algebra II or Chemistry at rigorous high schools also made greater gains in ACT College Readiness Benchmark attainment than all-ACT tested students who took these courses, improving 39 percentage points vs. 17 percentage points in Mathematics and 28 percentage points vs. 16 percentage points in Science (Figures 16 and 17).

Note also that students at rigorous schools who took Algebra II or Chemistry met the associated College Readiness Benchmark in percentages approaching those of all ACT-tested students who took Algebra II or Chemistry plus an additional higher-level course (50 percent vs. 56 percent in mathematics; 36 percent vs. 42 percent in science).

These figures also show the increased value added by another mathematics course, Trigonometry, over and above Algebra II. However, the benefits of a rigorous Algebra II course compared to the typical Algebra II course taken by ACT-tested students are substantial. Similarly, the benefits of a rigorous Chemistry course compared to the typical Chemistry course taken by ACT-tested students are also substantial, but students benefit even more when they also take a rigorous Physics course.

¹⁸ Based on 675,458 (All ACT-tested) and 41,445 (Rigorous Mathematics Schools) high school students who took the ACT and indicated that they would graduate from high school in 2004.

¹⁹ Based on 967,156 (All ACT-tested) and 52,758 (Rigorous Science Schools) high school students who took the ACT and indicated that they would graduate from high school in 2004.

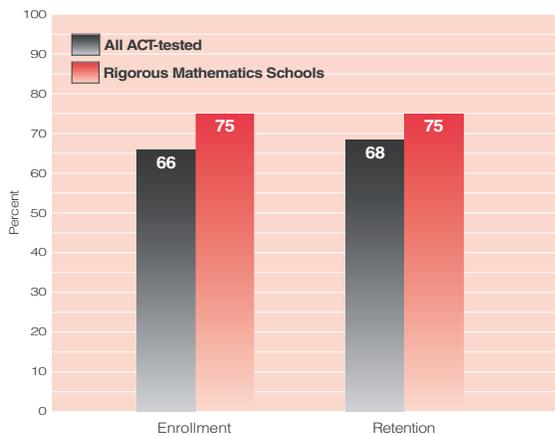


Figure 18: College Enrollment and Retention for High School Graduates Taking Algebra II (ACT-tested 2004 High School Graduates, ACT-tested 2004 Graduates of Rigorous Mathematics High Schools)²⁰

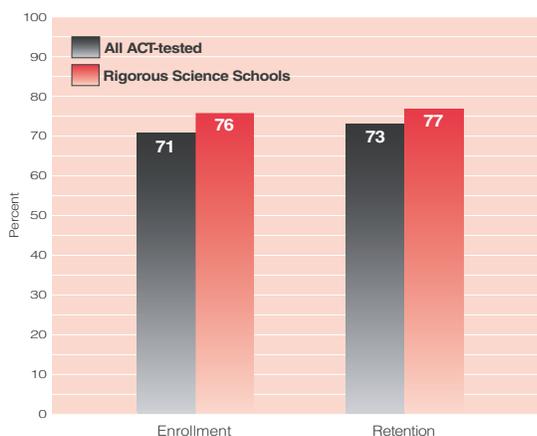


Figure 19: College Enrollment and Retention for High School Graduates Taking Chemistry (ACT-tested 2004 High School Graduates, ACT-tested 2004 Graduates of Rigorous Science High Schools)²¹

Furthermore, students who took such critical courses as Algebra II or Chemistry at these schools were more likely than all ACT-tested students who took Algebra II or Chemistry to enroll in college the fall following graduation and to return to the same institution for their second year (Figures 18 and 19).

And when we compare the percentages of students at rigorous high schools who met none, one to three, or all four College Readiness Benchmarks with those of students nationally (Figure 20), we also see that a smaller percentage of students from these schools meet no Benchmarks, and a greater percentage meet all four Benchmarks—evidence that these schools are making progress at helping the majority of their students prepare for postsecondary education.

These high schools are proving every day that core courses can be made rigorous and that rigorous content can be effectively taught to and learned by students.

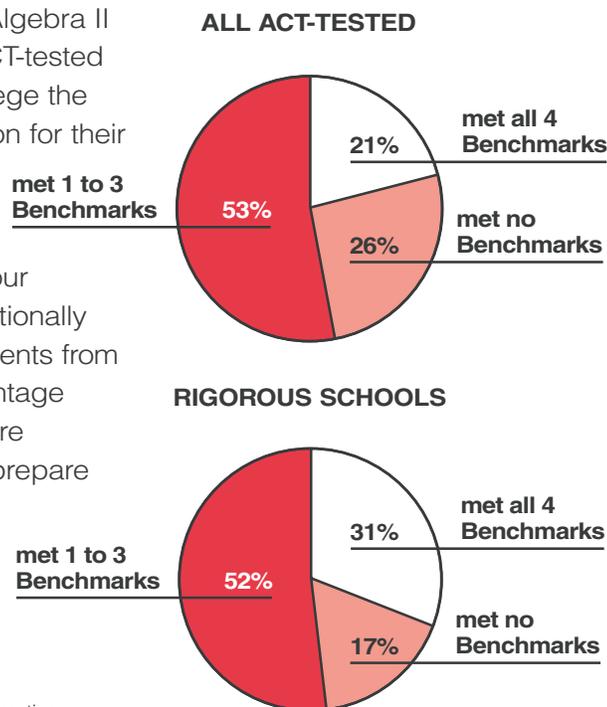


Figure 20: ACT College Readiness Benchmark Attainment by Number of Benchmarks Attained (2006 High School Graduates, 2006 Students from Rigorous High Schools)²²

²⁰ Based on 362,237 students nationwide and 24,052 students from rigorous mathematics schools (Enrollment) and 239,518 students nationwide and 17,940 students from rigorous mathematics schools (Retention) who took the ACT and indicated that they would graduate from high school in 2004, and who, according to National Student Clearinghouse data, both enrolled in college the fall following high school graduation and returned to the same institution for their second year of college.

²¹ Based on 512,389 students nationwide and 27,085 students from rigorous science schools (Enrollment) and 364,815 students nationwide and 20,672 students from rigorous science schools (Retention) who took the ACT and indicated that they would graduate from high school in 2004, and who, according to National Student Clearinghouse data, both enrolled in college the fall following high school graduation and returned to the same institution for their second year of college.

²² Based on 1,206,455 (All ACT-tested) and 110,362 (Rigorous Schools) high school students who took the ACT and indicated that they would graduate from high school in 2006.

4.

It Can Be Done

The rigor of core courses in our nation's high schools is at risk. Solutions are needed now.

This issue is solvable.

It has been a common thread throughout our country's history for some to lament the poor state of U.S. high schools, and in the two decades since the publication of *A Nation at Risk* there has been no shortage of such opinions. Often these concerns have been backed by concerted attempts at practical solutions, such as the excellence, restructuring, and standards movements (see sidebar, p. 8). These solutions have met with some degree of success, but the problem of lack of course rigor still persists.

We believe that the solution to the rigor problem is within our reach: states and schools need to ensure that their core course offerings focus squarely on the essential skills students must have in order to be prepared for postsecondary education, more students need to be offered the opportunity to take rigorous core courses, and teachers must be provided with the support they need to teach these rigorous courses. To this end, we recommend the following action steps:

1. Specify the number and kinds of courses that students need to take to graduate from high school ready for college and work. In the absence of rigorous high school graduation requirements, too many students are not taking either the right number or the right kind of courses they need in order to be ready for college and work. Graduation requirements must be aligned with college and work readiness expectations. At a minimum, these requirements should include:

- ▼ four years of English;
- ▼ at least three years of mathematics, including rigorous courses in Algebra I, Geometry, and Algebra II;
- ▼ three years of science, including rigorous courses in Biology, Chemistry, and Physics; and
- ▼ three years of social studies.

In keeping with recent ACT research (ACT, 2006b), we recommend incorporating reading expectations across the curriculum into state standards so that they specify the inclusion, by grade level, of increasingly complex reading materials in English, mathematics, science, and social studies. Students must have the opportunity to read complex materials across the curriculum so that they are better positioned to comprehend complex texts in all subjects once they enter college or workforce training.

The need to raise high school graduation requirements is echoed in a recent document authored by leaders of several U.S. educational organizations (Cohen, Lingenfelter, Meredith, & Ward, 2006). Several states are already taking steps to help guarantee that high school students take rigorous coursework. Texas (Venezia, Kirst, & Antonio, 2003), Arkansas (National Governors Association, 2005), as well as Indiana and Louisiana (Dougherty, Mellor, & Jian, 2006) have all recently mandated a college-preparatory core curriculum as the default requirement for high school graduation, while at least another 30 states are considering similar increases in high school graduation requirements.

2. Align high school course outcomes with state standards that are driven by the requirements of postsecondary education and work.

High school students should not have to take more and more courses to be ready for postsecondary education. Instead, we must improve the quality of those core courses that really matter in preparing students for college and work. In many U.S. high schools a large gap still exists between the high school curriculum and the requirements of postsecondary institutions. In addition, high school teachers appear to be trying to teach to too many state content standards rather than the smaller and more cohesive groups of essential course outcomes recommended by college instructors. High school core courses must be strengthened so that all students graduate ready for life after high school.

Just as it is essential for state standards to be aligned with postsecondary expectations, it is equally important for high school course outcomes to be aligned with state standards (Figure 21). A rigorous high school core curriculum must teach students the essential knowledge and skills they will need to be successful in postsecondary education and work. State standards must also delineate what students ought to know and be able to do in their high school courses in each subject area so that students have a solid foundation on which to begin the next course in the sequence. But we cannot forget that many eighth-graders enter high school without having learned the skills needed to perform well in high school. Not only must the high school curriculum be aligned with the

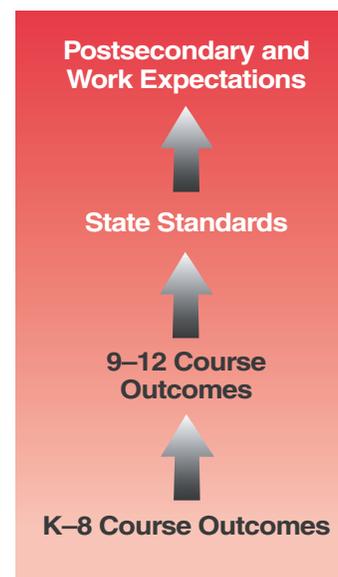


Figure 21: Alignment of High School Course Outcomes

requirements of postsecondary education, but the junior high school curriculum must reflect what is needed to be successful in high school.

3. Provide teacher support. Hire qualified teachers, and provide training or professional development support to current teachers to help them improve the quality of the courses they teach. Assign all teachers on the basis of their qualification to teach in their assigned subject area, and ensure that inexperienced teachers are not disproportionately assigned to teach those students who need the best teachers.

4. Expand access to high-quality, vertically aligned core courses. It is important not only that all courses with the same name reach a common standard of quality, but also that courses within a discipline be vertically aligned with each other such that the outcomes of one course serve as the prerequisites for the next course in the sequence. Our research suggests that too much class time is spent re-teaching content skills that are in fact high school course prerequisites, thus taking time away from teaching the important high school course outcomes needed to prepare students for college. ACT research also shows that students are losing momentum toward college readiness during the second half of high school. This evidence may well signify a lack of alignment between successive courses within a subject area. It is especially important that the courses within a high school are vertically as well as horizontally aligned to ensure that students are ready for college-level work and workforce training programs when they graduate.

Improving the rigor of high school core courses benefits not just those students who are traditionally considered bound for college, but the majority of high school students who typically have not benefited from advanced coursework or other similar efforts to increase college readiness. Before offering more students the opportunity to take college-level courses in high school, our data suggest that we must offer more rigorous, high-quality *high school*-level courses to all students to prepare them for college-level work.

5. Measure results at the course level. Student progress at gaining the knowledge and skills necessary for postsecondary success must be continually monitored at the course level. Such course-level monitoring is important not only so that students can learn what they need to learn and that interventions can be made to improve their progress as required, but also so that the courses themselves can be evaluated and strengthened to ensure that students are being taught essential content with the appropriate degree of rigor.

Conclusion

Raising course rigor alone won't completely solve the college readiness problem. Although academic achievement is a major contributor to students' level of college readiness, it is not the only one. It will take substantial efforts on the part of teachers, administrators, students, and parents, all of whom must be committed to the goal of ensuring that all students are ready for college and workforce training when they graduate from high school.

Students who are not ready for college are less likely to enroll in college, more likely to need remedial coursework during their first year of college, less likely to succeed in their college courses, and less likely to earn a college degree. If we do not raise the rigor of core courses, U.S. students are in danger of entering the workforce unprepared for the challenges of competing in a technology-based global economy. If we are unable to maintain and increase U.S. economic competitiveness throughout the world, then not just the graduates themselves but the nation at large will suffer.

There is no question that improved college readiness leads to greater success in college. It is crucial that we strengthen the high school core curriculum to improve the college readiness of all students. If we do not, the substantial proportion of students who up to now have not been given the education they deserve may never receive the boost they need to become ready for success after graduation. Let's fulfill the original intent of *A Nation at Risk* and offer every student a rigorous core curriculum that will prepare them for college and work by the time they graduate from high school.

Access to entrance to college . . . is only half the picture. True college opportunity includes having a real chance to succeed, which is clearly not happening often, as indicated by the fact that the percentage of four-year graduates among the U.S. adult population has barely increased since 1980, despite increasing attendance rates. . . . It is time to expand policy attention to emphasize not just access to college, but also access to success in college. High school course content . . . needs to reflect this so that students are clear about what it takes to succeed in college, including community college.

—*Venezia, Kirst, & Antonio, 2003*

Appendix

The conclusions in this report are based on large samples of students in the nation's schools who participated in ACT's college readiness programs: EXPLORE, PLAN, and the ACT. The students taking the ACT in 2005–2006 represented 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.

The tables below present selected demographic information about the students who took EXPLORE, PLAN, and the ACT during the 2005–2006 academic year.

	GENDER		
EPAS Program	Female (%)	Male (%)	No Response (%)
EXPLORE	49	49	2
PLAN	52	48	0
The ACT	54	43	3

	RACE/ETHNICITY					
EPAS Program	African American (%)	American Indian (%)	Asian American (%)	Hispanic (%)	White (%)	No Response (%)
EXPLORE	17	2	2	8	58	13
PLAN	12	1	3	7	66	11
The ACT	12	1	3	7	63	14

	SCHOOL GEOGRAPHIC REGION			
EPAS Program	East (%)	Midwest (%)	Southwest (%)	West (%)
EXPLORE	16	47	29	7
PLAN	21	46	17	16
The ACT	28	39	14	19

In addition, chapter 3 of this report examines the academic performance of a subset of students who took the ACT during the 2003–2004 academic year at 217 rigorous mathematics high schools and 217 rigorous science high schools across the United States. (Fifty-two of the schools were rigorous in both mathematics and science, for a total of 382 unique institutions.) Of schools with sample sizes of at least 100 students, with a minimum of 5 students taking Algebra I and Geometry only or Biology only, these schools represent the 10 percent with the greatest increases in ACT Mathematics or Science Test scores associated with taking Algebra II in addition to Algebra I and Geometry or Chemistry in addition to Biology. The table below presents selected demographic information about these students as well as the geographical representation of the schools. Information about the full ACT-tested graduating class of 2004 is also included for purposes of comparison.

	GENDER		
2004 Sample	Female (%)	Male (%)	No Response (%)
Rigorous Schools	52	47	1
All ACT-tested	56	43	1

	RACE/ETHNICITY					
2004 Sample	African American (%)	American Indian (%)	Asian American (%)	Hispanic (%)	White (%)	No Response (%)
Rigorous Schools	5	1	4	4	74	12
All ACT-tested	11	1	3	7	67	10

	SCHOOL GEOGRAPHIC REGION			
2004 Sample	East (%)	Midwest (%)	Southwest (%)	West (%)
Rigorous Schools	15	60	7	18
All ACT-tested	25	40	14	19

Below is a list, organized by state and city, of the 382 schools included in the analysis. We applaud the achievements of these students and acknowledge the efforts of their teachers and school administrators.

ALABAMA

Auburn

AUBURN HIGH SCHOOL

Birmingham

JOHN CARROLL HIGH SCHOOL

OAK MOUNTAIN HIGH SCHOOL

Cullman

CULLMAN HIGH SCHOOL

Decatur

AUSTIN HIGH SCHOOL

Hoover

HOOVER HIGH SCHOOL

Madison

BOB JONES HIGH SCHOOL

Mountain Brook

MOUNTAIN BROOK HIGH SCHOOL

Pelham

PELHAM HIGH SCHOOL

Theodore

THEODORE HIGH SCHOOL

ARKANSAS

Little Rock

WILBUR D MILLS UNIVERSITY STUDIES
HIGH SCHOOL

North Little Rock

NORTH LITTLE ROCK HIGH
SCHOOL–WEST CAMPUS

Searcy

SEARCY HIGH SCHOOL

CALIFORNIA

Carlsbad

LACOSTA CANYON HIGH SCHOOL

Elk Grove

ELK GROVE HIGH SCHOOL

Encinitas

TORREY PINES HIGH SCHOOL

Manhattan Beach

MIRA COSTA HIGH SCHOOL

Murrieta

MURRIETA VALLEY HIGH SCHOOL

Rolling Hills Estates

PALOS VERDES PENINSULA HIGH
SCHOOL

COLORADO

Alamosa

ALAMOSA HIGH SCHOOL

Aurora

GRANDVIEW HIGH SCHOOL

SMOKY HILL HIGH SCHOOL

Boulder

BOULDER HIGH SCHOOL

FAIRVIEW HIGH SCHOOL

Broomfield

BROOMFIELD HIGH SCHOOL

Canon City

CANON CITY SENIOR HIGH SCHOOL

Castle Rock

DOUGLAS COUNTY HIGH SCHOOL

Colorado Springs

CHEYENNE MOUNTAIN HIGH SCHOOL

LIBERTY HIGH SCHOOL

PINE CREEK HIGH SCHOOL

WILLIAM J PALMER HIGH SCHOOL

Denver

EAST HIGH SCHOOL

THOMAS JEFFERSON HIGH SCHOOL

Fort Collins

FORT COLLINS HIGH SCHOOL

POUDRE HIGH SCHOOL

Fruita

FRUITA MONUMENT HIGH SCHOOL

Greeley

GREELEY CENTRAL HIGH SCHOOL

Highlands Ranch

THUNDERRIDGE HIGH SCHOOL

Lafayette

CENTAURUS HIGH SCHOOL

Lakewood

BEAR CREEK HIGH SCHOOL

LAKESWOOD HIGH SCHOOL

Littleton

ARAPAHOE HIGH SCHOOL

CHATFIELD SENIOR HIGH SCHOOL

COLUMBINE HIGH SCHOOL

HERITAGE HIGH SCHOOL

Louisville

MONARCH HIGH SCHOOL

Loveland

LOVELAND HIGH SCHOOL

THOMPSON VALLEY HIGH SCHOOL

Niwot

NIWOT HIGH SCHOOL

Parker

PONDEROSA HIGH SCHOOL

Westminster

STANDLEY LAKE HIGH SCHOOL

CONNECTICUT

Ridgefield

RIDGEFIELD HIGH SCHOOL

FLORIDA

Coral Springs

J P TARAVELLA HIGH SCHOOL

Gainesville

BUCHHOLZ HIGH SCHOOL

Niceville

NICEVILLE SENIOR HIGH SCHOOL

Orlando

EDGEWATER HIGH SCHOOL

Plant City

DURANT SENIOR HIGH SCHOOL

Spring Hill

F W SPRINGSTEAD HIGH SCHOOL

Tallahassee

LEON HIGH SCHOOL

LINCOLN HIGH SCHOOL

Wellington

WELLINGTON HIGH SCHOOL

West Palm Beach

ALEXANDER W DREYFOOS JR SCHOOL
OF THE ARTS

GEORGIA

Fayetteville

STARR'S MILL HIGH SCHOOL

Watkinsville

OCONEE COUNTY HIGH SCHOOL

IDAHO

Boise

BOISE HIGH SCHOOL

Eagle

EAGLE HIGH SCHOOL

Idaho Falls

SKYLINE HIGH SCHOOL

ILLINOIS

Addison

ADDISON TRAIL HIGH SCHOOL

Antioch

ANTIOCH COMMUNITY HIGH SCHOOL

Arlington Heights

JOHN HERSEY HIGH SCHOOL

Aurora

WAUBONSIE VALLEY HIGH SCHOOL

Barrington

BARRINGTON COMMUNITY HIGH SCHOOL

Belleville

BELLEVILLE TOWNSHIP HIGH SCHOOL EAST

BELLEVILLE TOWNSHIP HIGH SCHOOL WEST

Belvidere

BELVIDERE HIGH SCHOOL

Bensenville

FENTON HIGH SCHOOL

Bloomington

BLOOMINGTON HIGH SCHOOL

Breese

MATER DEI CATHOLIC HIGH SCHOOL

Carol Stream

GLENBARD NORTH HIGH SCHOOL

Carpentersville

DUNDEE-CROWN HIGH SCHOOL

Cary

CARY GROVE HIGH SCHOOL

Centralia

CENTRALIA HIGH SCHOOL

Champaign

CENTENNIAL HIGH SCHOOL

CHAMPAIGN CENTRAL HIGH SCHOOL

Charleston

CHARLESTON HIGH SCHOOL

Chicago

BROTHER RICE HIGH SCHOOL

NORTHSIDE COLLEGE PREP HIGH SCHOOL

Clinton

CLINTON COMMUNITY HIGH SCHOOL

Collinsville

COLLINSVILLE HIGH SCHOOL

Crystal Lake

CRYSTAL LAKE CENTRAL HIGH SCHOOL

CRYSTAL LAKE SOUTH HIGH SCHOOL

PRAIRIE RIDGE HIGH SCHOOL

Danville

DANVILLE HIGH SCHOOL

DeKalb

DeKALB HIGH SCHOOL

Dixon

DIXON HIGH SCHOOL

Downers Grove

COMMUNITY HIGH SCHOOL DISTRICT 99 NORTH HIGH SCHOOL

COMMUNITY HIGH SCHOOL DISTRICT 99 SOUTH HIGH SCHOOL

Edwardsville

EDWARDSVILLE SENIOR HIGH SCHOOL

Effingham

EFFINGHAM HIGH SCHOOL

Elk Grove Village

ELK GROVE HIGH SCHOOL

Elmhurst

YORK COMMUNITY HIGH SCHOOL

Evergreen Park

EVERGREEN PARK COMMUNITY HIGH SCHOOL

Freeport

FREEPORT SENIOR HIGH SCHOOL

Galesburg

GALESBURG HIGH SCHOOL

Geneva

GENEVA COMMUNITY HIGH SCHOOL

Glenview

GLENBROOK SOUTH HIGH SCHOOL

Gurnee

WARREN TOWNSHIP HIGH SCHOOL

Herscher

HERSCHER HIGH SCHOOL

Highland

HIGHLAND HIGH SCHOOL

Hoffman Estates

HOFFMAN ESTATES HIGH SCHOOL

J B CONANT HIGH SCHOOL

Jerseyville

JERSEY COMMUNITY HIGH SCHOOL

La Grange

LYONS TOWNSHIP HIGH SCHOOL NORTH CAMPUS

Lake Forest

LAKE FOREST HIGH SCHOOL

Lake Zurich

LAKE ZURICH SENIOR HIGH SCHOOL

Lansing

ILLIANA CHRISTIAN HIGH SCHOOL

Libertyville

LIBERTYVILLE HIGH SCHOOL

Lincolnshire

ADLAI E STEVENSON HIGH SCHOOL

Lisle

LISLE HIGH SCHOOL

Lockport

LOCKPORT TOWNSHIP HIGH SCHOOL

Macomb

MACOMB HIGH SCHOOL

Marengo

COMMUNITY HIGH SCHOOL

Mascoutah

MASCOUTAH HIGH SCHOOL

Minooka

MINOOKA COMMUNITY HIGH SCHOOL

Moline

MOLINE SENIOR HIGH SCHOOL

Morris

MORRIS COMMUNITY HIGH SCHOOL

Mundelein

CARMEL HIGH SCHOOL

Naperville

NAPERVILLE CENTRAL HIGH SCHOOL

NAPERVILLE NORTH HIGH SCHOOL

NEUQUA VALLEY HIGH SCHOOL

Normal

NORMAL COMMUNITY WEST HIGH SCHOOL

Northbrook

GLENBROOK NORTH HIGH SCHOOL

Oak Forest

OAK FOREST HIGH SCHOOL

Oak Park

OAK PARK AND RIVER FOREST HIGH SCHOOL

O'Fallon

O'FALLON TOWNSHIP HIGH SCHOOL

Orland Park

CARL SANDBURG HIGH SCHOOL

Palatine

PALATINE HIGH SCHOOL

WILLIAM FREMD HIGH SCHOOL

Palos Heights

ALAN B SHEPARD HIGH SCHOOL

Palos Hills

AMOS ALONZO STAGG HIGH SCHOOL

Park Ridge

MAINE TOWNSHIP HIGH SCHOOL EAST

Peoria

PEORIA HIGH SCHOOL

PEORIA NOTRE DAME HIGH SCHOOL

Peotone

PEOTONE HIGH SCHOOL

Plainfield

PLAINFIELD HIGH SCHOOL CENTRAL CAMPUS

PLAINFIELD SOUTH HIGH SCHOOL

Quincy

QUINCY NOTRE DAME HIGH SCHOOL

QUINCY SENIOR HIGH SCHOOL

Rock Island

ROCK ISLAND HIGH SCHOOL

Rockford

BOYLAN CATHOLIC HIGH SCHOOL

Rockton

HONONEGAH COMMUNITY HIGH SCHOOL

Rolling Meadows

ROLLING MEADOWS HIGH SCHOOL

Saint Charles

SAINT CHARLES EAST HIGH SCHOOL

SAINT CHARLES NORTH HIGH SCHOOL

Skokie

NILES TOWNSHIP WEST HIGH SCHOOL

SpringfieldSACRED HEART GRIFFIN HIGH SCHOOL
SPRINGFIELD HIGH SCHOOL**Sterling**

STERLING HIGH SCHOOL

Summit

ARGO COMMUNITY HIGH SCHOOL

Tinley Park

VICTOR J ANDREW HIGH SCHOOL

Troy

TRIAD HIGH SCHOOL

Vernon Hills

VERNON HILLS HIGH SCHOOL

Villa Park

WILLOWBROOK HIGH SCHOOL

Washington

WASHINGTON COMMUNITY HIGH SCHOOL

Wauconda

WAUCONDA HIGH SCHOOL

West Chicago

COMMUNITY HIGH SCHOOL 94

Winnetka

NEW TRIER TOWNSHIP HIGH SCHOOL

WoodstockMARIAN CENTRAL CATHOLIC HIGH SCHOOL
WOODSTOCK HIGH SCHOOL**INDIANA****Fort Wayne**

HOMESTEAD HIGH SCHOOL

IndianapolisLAWRENCE NORTH HIGH SCHOOL
NORTH CENTRAL HIGH SCHOOL**IOWA****Bettendorf**

BETTENDORF HIGH SCHOOL

Cedar RapidsGEORGE WASHINGTON HIGH SCHOOL
JOHN F KENNEDY SENIOR HIGH SCHOOL**Dubuque**HEMPSTEAD HIGH SCHOOL
WAHLERT HIGH SCHOOL**Iowa City**CITY HIGH SCHOOL
WEST HIGH SCHOOL**Spencer**

SPENCER HIGH SCHOOL

KANSAS**Emporia**

EMPORIA SENIOR HIGH SCHOOL

Hutchinson

HUTCHINSON SENIOR HIGH SCHOOL

Maize

MAIZE HIGH SCHOOL

Manhattan

MANHATTAN HIGH SCHOOL

Overland Park

BLUE VALLEY NORTH HIGH SCHOOL

Shawnee MissionSHAWNEE MISSION EAST HIGH SCHOOL
SHAWNEE MISSION NORTHWEST HIGH SCHOOL
SHAWNEE MISSION SOUTH HIGH SCHOOL**Stillwell**

BLUE VALLEY HIGH SCHOOL

Topeka

HAYDEN HIGH SCHOOL

WichitaBISHOP CARROLL HIGH SCHOOL
KAPAUN MOUNT CARMEL HIGH SCHOOL
WICHITA HIGH SCHOOL EAST**KENTUCKY****Lexington**

PAUL LAURENCE DUNBAR HIGH SCHOOL

Louisville

SAINT XAVIER HIGH SCHOOL

Nicholasville

WEST JESSAMINE HIGH SCHOOL

MICHIGAN**Ann Arbor**ANN ARBOR PIONEER HIGH SCHOOL
ANN ARBOR HURON HIGH SCHOOL**Bay City**

CENTRAL HIGH SCHOOL

Birmingham

SEAHOLM HIGH SCHOOL

Bloomfield Hills

LAHSER HIGH SCHOOL

Byron Center

BYRON CENTER SENIOR HIGH SCHOOL

Canton

PLYMOUTH CANTON HIGH SCHOOL

Chelsea

CHELSEA HIGH SCHOOL

Clinton Township

CHIPPEWA VALLEY HIGH SCHOOL

East Lansing

EAST LANSING HIGH SCHOOL

Farmington Hills

NORTH FARMINGTON HIGH SCHOOL

Frankenmuth

FRANKENMUTH HIGH SCHOOL

Grand RapidsEAST KENTWOOD HIGH SCHOOL
FOREST HILLS CENTRAL HIGH SCHOOL
KENOWA HILLS HIGH SCHOOL**Grosse Pointe**GROSSE POINTE NORTH HIGH SCHOOL
GROSSE POINTE SOUTH HIGH SCHOOL**Howell**

HOWELL HIGH SCHOOL

Hudsonville

UNITY CHRISTIAN HIGH SCHOOL

Ionia

IONIA HIGH SCHOOL

Jackson

LUMEN CHRISTI HIGH SCHOOL

LivoniaBENJAMIN FRANKLIN HIGH SCHOOL
LADYWOOD HIGH SCHOOL**Marshall**

MARSHALL HIGH SCHOOL

MidlandHERBERT HENRY DOW HIGH SCHOOL
MIDLAND HIGH SCHOOL**Northville**

NORTHVILLE HIGH SCHOOL

Okemos

OKEMOS HIGH SCHOOL

Owosso

OWOSSO HIGH SCHOOL

Petoskey

PETOSKEY HIGH SCHOOL

Redford

DETROIT CATHOLIC CENTRAL HIGH SCHOOL

Rochester

ROCHESTER HIGH SCHOOL

Rockford

ROCKFORD SENIOR HIGH SCHOOL

Shelby Township

EISENHOWER SENIOR HIGH SCHOOL

Sterling HeightsADLAI E STEVENSON HIGH SCHOOL
HENRY FORD II HIGH SCHOOL**Trenton**

TRENTON HIGH SCHOOL

Vicksburg

VICKSBURG COMMUNITY HIGH SCHOOL

White Lake

LAKELAND HIGH SCHOOL

MINNESOTA

Circle Pines

CENTENNIAL HIGH SCHOOL

Maplewood

HILL-MURRAY SCHOOL

Moorhead

MOORHEAD SENIOR HIGH SCHOOL

Rochester

CENTURY HIGH SCHOOL

MAYO HIGH SCHOOL

Saint Cloud

CATHEDRAL HIGH SCHOOL

TECHNICAL HIGH SCHOOL

MISSISSIPPI

Brandon

BRANDON HIGH SCHOOL

Brookhaven

BROOKHAVEN HIGH SCHOOL

Hattiesburg

HATTIESBURG HIGH SCHOOL BLAIR

Lucedale

GEORGE COUNTY HIGH SCHOOL

Oxford

OXFORD HIGH SCHOOL

Picayune

PICAYUNE MEMORIAL HIGH SCHOOL

Ridgeland

RIDGELAND HIGH SCHOOL

Tupelo

TUPELO HIGH SCHOOL

Vicksburg

VICKSBURG HIGH SCHOOL

MISSOURI

Arnold

FOX SENIOR HIGH SCHOOL

Ballwin

LAFAYETTE HIGH SCHOOL

Cape Girardeau

CENTRAL HIGH SCHOOL

Florissant

McCLUER NORTH HIGH SCHOOL

Jefferson City

HELIA'S INTERPARISH HIGH SCHOOL

Kansas City

SAINT TERESA'S ACADEMY

Lee's Summit

LEE'S SUMMIT NORTH HIGH SCHOOL

Saint Charles

FRANCIS HOWELL HIGH SCHOOL

MONTANA

Bozeman

BOZEMAN HIGH SCHOOL

NEBRASKA

Omaha

MILLARD WEST HIGH SCHOOL

Papillion

PAPILLION-LaVISTA HIGH SCHOOL

NEW MEXICO

Carlsbad

CARLSBAD HIGH SCHOOL

Clovis

CLOVIS HIGH SCHOOL

Los Alamos

LOS ALAMOS HIGH SCHOOL

NEW YORK

Bronx

THE BRONX HIGH SCHOOL OF SCIENCE

Guilderland Center

GUILDERLAND HIGH SCHOOL

Lindenhurst

LINDENHURST SENIOR HIGH SCHOOL

Orchard Park

ORCHARD PARK HIGH SCHOOL

Smithtown

SMITHTOWN HIGH SCHOOL

NORTH CAROLINA

Fayetteville

JACK BRITT HIGH SCHOOL

NORTH DAKOTA

Bismarck

BISMARCK HIGH SCHOOL

CENTURY HIGH SCHOOL

Fargo

NORTH HIGH SCHOOL

Grand Forks

RED RIVER SENIOR HIGH SCHOOL

Mandan

MANDAN HIGH SCHOOL

OHIO

Akron

ARCHBISHOP HOBAN HIGH SCHOOL

Austintown

AUSTINTOWN FITCH HIGH SCHOOL

Bay Village

BAY HIGH SCHOOL

Cincinnati

ANDERSON HIGH SCHOOL

ARCHBISHOP McNICHOLAS HIGH SCHOOL

SCHOOL

SYCAMORE HIGH SCHOOL

Clayton

NORTHMONT SENIOR HIGH SCHOOL

Dublin

DUBLIN COFFMAN HIGH SCHOOL

DUBLIN SCIOTO HIGH SCHOOL

Gahanna

GAHANNA LINCOLN HIGH SCHOOL

Grafton

MIDVIEW HIGH SCHOOL

Hilliard

HILLIARD DAVIDSON HIGH SCHOOL

Hudson

HUDSON HIGH SCHOOL

Lexington

LEXINGTON HIGH SCHOOL

Mayfield

MAYFIELD HIGH SCHOOL

Mentor

MENTOR HIGH SCHOOL

Miamisburg

MIAMISBURG HIGH SCHOOL

Milford

MILFORD HIGH SCHOOL

North Canton

HOOVER HIGH SCHOOL

North Olmsted

NORTH OLMSTED HIGH SCHOOL

Ottawa

OTTAWA-GLANDORF HIGH SCHOOL

Painesville

RIVERSIDE HIGH SCHOOL

Parma Heights

HOLY NAME HIGH SCHOOL

Perrysburg

PERRYSBURG HIGH SCHOOL

Pickerington

PICKERINGTON CENTRAL HIGH SCHOOL

Poland

POLAND SEMINARY HIGH SCHOOL

Richfield

REVERE HIGH SCHOOL

Sylvania

SYLVANIA NORTHVIEW HIGH SCHOOL

SYLVANIA SOUTHVIEW HIGH SCHOOL

Tipp City

TIPPECANOE HIGH SCHOOL

Wapakoneta

WAPAKONETA SENIOR HIGH SCHOOL

West Chester

LAKOTA WEST HIGH SCHOOL

Westlake

WESTLAKE HIGH SCHOOL

Worthington

THOMAS WORTHINGTON HIGH SCHOOL

OKLAHOMA

Broken Arrow

BROKEN ARROW HIGH SCHOOL

Claremore

CLAREMORE HIGH SCHOOL

Edmond

EDMOND NORTH HIGH SCHOOL
EDMOND SANTA FE HIGH SCHOOL

Sand Springs

CHARLES PAGE HIGH SCHOOL

Stillwater

STILLWATER HIGH SCHOOL

Tulsa

UNION HIGH SCHOOL

PENNSYLVANIA

Canonsburg

CANON-McMILLAN HIGH SCHOOL

SOUTH DAKOTA

Brookings

BROOKINGS HIGH SCHOOL

Sioux Falls

LINCOLN HIGH SCHOOL
OGORMAN HIGH SCHOOL
ROOSEVELT HIGH SCHOOL

TENNESSEE

Bartlett

BARTLETT HIGH SCHOOL

Church Hill

VOLUNTEER HIGH SCHOOL

Clarksville

ROSSVIEW HIGH SCHOOL

Dyersburg

DYERSBURG HIGH SCHOOL

Greeneville

GREENEVILLE HIGH SCHOOL

Knoxville

BEARDEN HIGH SCHOOL
KARNS HIGH SCHOOL
WEST HIGH SCHOOL

Lebanon

WILSON CENTRAL HIGH SCHOOL

Maryville

MARYVILLE HIGH SCHOOL

Murfreesboro

BLACKMAN HIGH SCHOOL
RIVERDALE HIGH SCHOOL

Oak Ridge

OAK RIDGE HIGH SCHOOL

Sevierville

SEVIER COUNTY HIGH SCHOOL

Seymour

SEYMOUR HIGH SCHOOL

TEXAS

Austin

WESTWOOD HIGH SCHOOL

Coppell

COPPELL SENIOR HIGH SCHOOL

Dallas

HIGHLAND PARK HIGH SCHOOL

Georgetown

GEORGETOWN HIGH SCHOOL

Houston

JERSEY VILLAGE HIGH SCHOOL

Katy

CINCO RANCH HIGH SCHOOL
JAMES E TAYLOR HIGH SCHOOL

Plano

PLANO EAST SENIOR HIGH SCHOOL
PLANO WEST SENIOR HIGH SCHOOL

Richardson

J J PEARCE HIGH SCHOOL
L V BERKNER HIGH SCHOOL

San Angelo

CENTRAL HIGH SCHOOL

San Antonio

TOM CLARK HIGH SCHOOL

UTAH

American Fork

AMERICAN FORK HIGH SCHOOL

Murray

MURRAY HIGH SCHOOL

WISCONSIN

Appleton

APPLETON NORTH HIGH SCHOOL
APPLETON WEST HIGH SCHOOL

Baraboo

BARABOO HIGH SCHOOL

Brookfield

BROOKFIELD CENTRAL HIGH SCHOOL
BROOKFIELD EAST HIGH SCHOOL

DeForest

DeFOREST HIGH SCHOOL

Fond du Lac

FOND DU LAC HIGH SCHOOL

Green Bay

EAST HIGH SCHOOL
NOTRE DAME ACADEMY

Madison

JAMES MADISON MEMORIAL HIGH SCHOOL
WEST HIGH SCHOOL

McFarland

MCFARLAND HIGH SCHOOL

Mequon

HOMESTEAD HIGH SCHOOL

New Berlin

EISENHOWER HIGH SCHOOL
NEW BERLIN WEST HIGH SCHOOL

Oak Creek

OAK CREEK-FRANKLIN HIGH SCHOOL

Salem

WESTOSHA CENTRAL HIGH SCHOOL

Stoughton

STOUGHTON HIGH SCHOOL

Sun Prairie

SUN PRAIRIE SENIOR HIGH SCHOOL

Superior

SUPERIOR SENIOR HIGH SCHOOL

Verona

VERONA AREA HIGH SCHOOL

Wales

KETTLE MORAINNE HIGH SCHOOL

Waukesha

WAUKESHA SOUTH HIGH SCHOOL
WAUKESHA WEST HIGH SCHOOL

Wausau

WAUSAU EAST HIGH SCHOOL

Wauwatosa

WAUWATOSA EAST HIGH SCHOOL
WAUWATOSA WEST HIGH SCHOOL

West Allis

NATHAN HALE HIGH SCHOOL

Weston

D C EVEREST SENIOR HIGH SCHOOL

WYOMING

Sheridan

SHERIDAN HIGH SCHOOL

The remainder of this appendix provides detailed information on programs and concepts discussed in this report.

ACT's Educational Planning and Assessment System (EPAS)

The data in this report come primarily from administrations of the ACT 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.

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 ACT, for students in grades 11 and 12, measures students' academic readiness to make successful transitions to college and work after high school. The ACT is the most widely accepted and used test by postsecondary institutions across the U.S. for college admission and course placement.

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 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 1992, when EXPLORE was added as the newest component of EPAS. Most recently, in 2003 and 2005, we established the ACT College Readiness Benchmarks, which are defined and discussed in detail below.

For more than forty years the ACT 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 the high school curriculum. The ACT 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) measure achievement because each is firmly based in the curriculum of the grade level for which it is intended. Every three to four years, we conduct our National Curriculum Survey, in which we ask more than 20,000 educators nationwide across grades 7–14 to identify the knowledge and skills that are important for students to know to be ready for college-level work. We examine the objectives for instruction in grades 7 through 12 for all states that have published such objectives. 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) consists of four tests: English, Mathematics, Reading, and Science. Students who take the ACT are also given the option of taking the ACT Writing Test. The skills assessed in each of these five tests are summarized below.

English. The questions 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 questions offer a certain richness and complexity. While some questions 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 questions in the Mathematics tests cover four cognitive levels: Knowledge and Skills, Direct Application, Understanding Concepts, and Integrating Conceptual Understanding. Knowledge and Skills questions 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 questions require the student to use one or more facts, definitions, formulas, or procedures to solve straightforward problems set in real-world situations. Understanding Concepts questions 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 questions test the student's ability to achieve an integrated understanding of two or more major concepts to solve non-routine problems.

Reading. The questions 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. Questions 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 complementary and mutually supportive skills that readers must bring to bear in studying written materials across a range of subject areas.

Science. The questions in the Science tests measure students' mastery of the interpretation, analysis, evaluation, reasoning, and problem-solving skills required in the natural sciences. The questions 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 questions 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.

Writing. The Writing Test is an achievement test designed to measure students' writing proficiency. It was developed to reflect the type of writing found in rigorous high school writing curricula and expected of students entering first-year college composition courses. The Writing Test consists of one writing prompt that briefly states an issue and describes two points of view on that issue. Students are asked to write in response to a question about their position on the issue described in the writing prompt. In doing so, students may adopt one or the other of the perspectives described in the prompt, or they may present a different point of view on the issue. Students' scores are not affected by the point of view they take on the issue. Prompts are designed to be appropriate for response in a 30-minute timed test and to reflect students' interests and experiences.

EPAS Score Scales

The English, Mathematics, Reading, and Science tests within EPAS are each scored on a common score scale ranging from 1 (lowest) to 25 for EXPLORE, 32 for PLAN, and 36 for the ACT. The optional ACT Writing Test is scored on a scale ranging from 2 (lowest) to 12.

Students receive both total test scores and subtest scores in each of the EPAS programs. For example, the ACT reports a minimum of 12 scores: four test scores (English, Mathematics, Reading, and Science), one composite score, and seven subscores (two in English, three in Mathematics, and two in Reading). The ACT also reports two additional scores to students who take the optional Writing Test: Writing Test score and combined English/Writing score. Students who take the Writing Test also receive narrative comments intended to help them improve their writing.

ACT's Recommended Core Curriculum

The core curriculum we recommend is based on the curriculum proposed in *A Nation at Risk* (National Commission on Excellence in Education, 1983). We have long held that this number of courses prepares students for college or other forms of postsecondary training better than a smaller number of courses. The courses that constitute our 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 U.S. History, World History, and U.S. 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.

ACT's College Readiness Benchmarks

We work 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. In doing this work, we have 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

ACT's College Readiness Benchmarks

Test	EXPLORE	PLAN	The ACT
English	13	15	18
Mathematics	17	19	22
Reading	15	17	21
Science	20	21	24

successful in a standard first-year college course. Data from 98 institutions and more than 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, or 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 college students in the areas of English, mathematics, social sciences, and natural sciences, namely English Composition; Algebra; History, Psychology, Sociology, Political Science, and Economics; and Biology, respectively. The ACT scores established as College Readiness Benchmarks are 18 on the English Test, 22 on the Mathematics Test, 21 on the Reading Test, and 24 on the Science Test.

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. We will work with individual postsecondary institutions, or groups of institutions within a state, to conduct 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 College Readiness Benchmarks for the ACT. These scores indicate, based on their performance on EXPLORE (grade 8) and PLAN (grade 10), whether students are on target 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, 15 on the Reading Test, and 20 on the Science Test; in PLAN, the scores are 15 on the English Test, 19 on the Mathematics Test, 17 on the Reading Test, and 21 on the Science Test.

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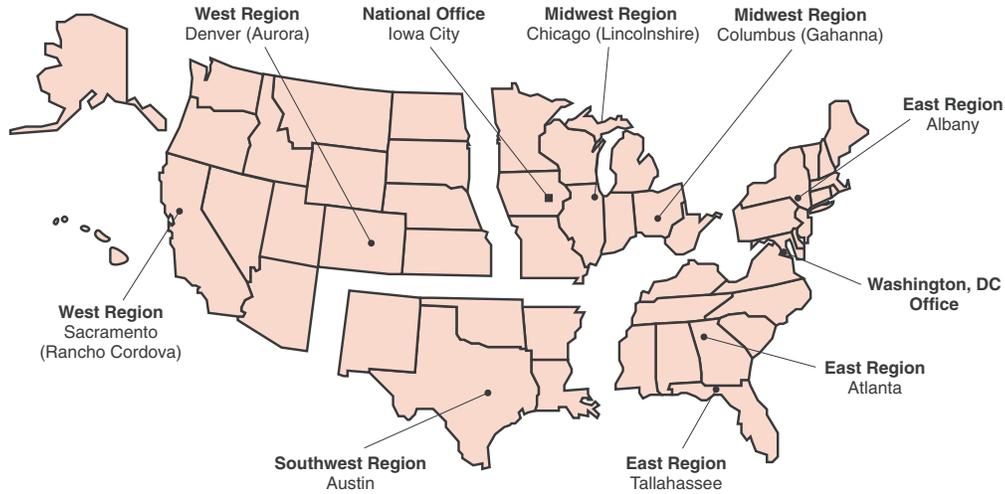
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