COLLEGE READINESS

Affirming the Goal

Is College and Career Readiness an Internationally Competitive Standard?

ACT®

ACT is an independent, not-for-profit organization that provides assessment, research, information, and program management services in the broad areas of education and workforce development. Each year we serve millions of people in high schools, colleges, professional associations, businesses, and government agencies, nationally and internationally. Though designed to meet a wide array of needs, all ACT programs and services have one guiding purpose—helping people achieve education and workplace success.

ACT, Inc., thanks the Organisation for Economic Co-operation and Development for its guidance and support throughout the research project described in this report. ACT also thanks the National Center for Education Statistics for its assistance in designing and nurturing the study.

Affirming the Goal

Is College and Career Readiness an Internationally Competitive Standard?

ACT®

Affirming the Goal

Is College and Career Readiness an Internationally Competitive Standard?

Every child in the United States deserves a world-class education.

Every child deserves to be educated to high standards that offer opportunities to be successful in an increasingly competitive global economy.

But in a world that is becoming more competitive through increasing international labor markets and rapid technological advances, the US is facing new challenges to its economic competitiveness.[1] Jobs in a competitive global economy are demanding higher-level skills, higher productivity, and innovation,[2] and other nations are surpassing the US in improving their educational systems to increase achievement, reduce achievement gaps, and elevate the teaching profession.[3] In other words, they are educating themselves as a way to a better economy. So must we.

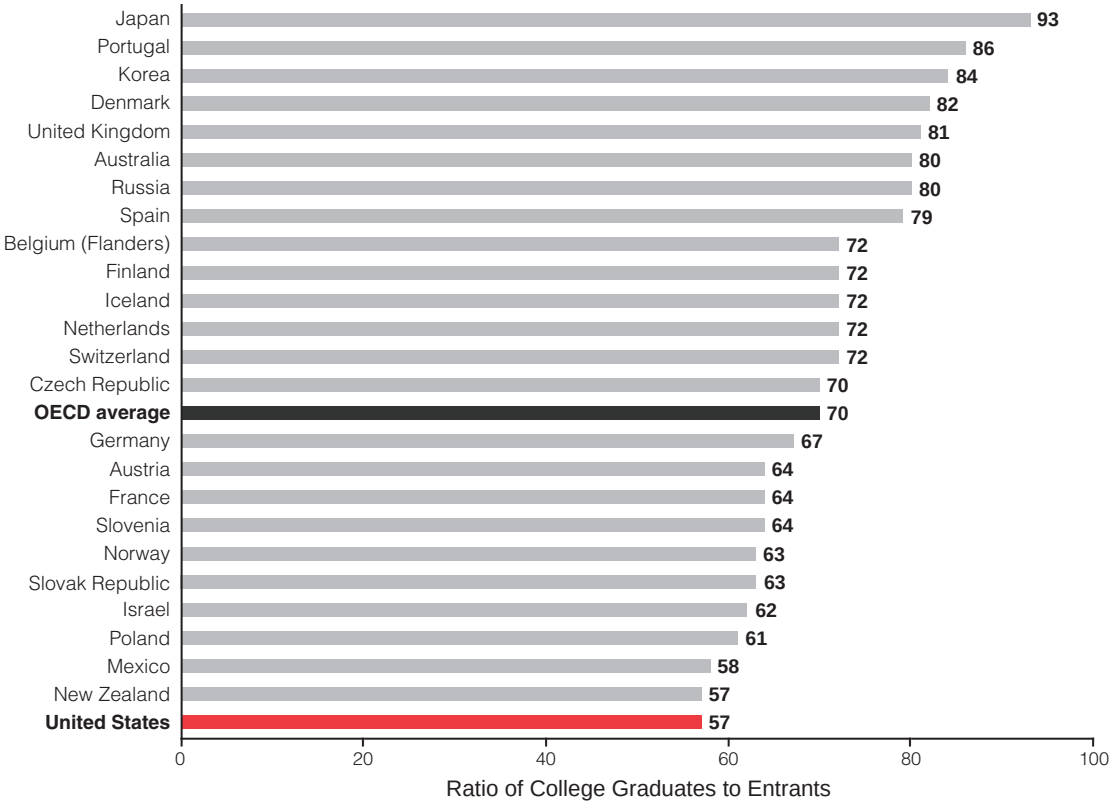
While the race to increase economic competitiveness is often portrayed as a zero-sum game, it is not. As all nations increase educational attainment and economic competitiveness, the global economic pie gets bigger and there is more of it to distribute.

To remain economically competitive, the US must develop a highly skilled and adaptable workforce capable of meeting productivity demands and adjusting rapidly to changing technologies and an increasingly global environment.[4] Simply stated, the US has no choice but to develop a quality educational system that offers a world-class education to all of its students as a centerpiece of our nation's economic competitiveness.

As in most developed countries, postsecondary education in the US (i.e., two- and four-year institutions, trade and technical schools) has become the access point for individuals to acquire the knowledge and skills they need to meet the demands of increased globalization. Experts predict that most of the fastest-growing occupations in the US over the next decade will require skill levels beyond those gained in high school.[5] Numerous government and business sources have called on the US education system to increase the number of postsecondary graduates equipped with the knowledge and skills necessary to succeed in an internationally competitive labor market.[6] The economic returns of acquiring these skills are substantial for individuals, societies, and economies, and because a skilled workforce is a major contributor to workplace productivity, such skills development is a key driver of economic growth and international competitiveness. The economic returns of acquiring these skills are substantial for individuals, societies, and economies.[7]

Given the importance of raising educational attainment levels to meet workplace demands, it is discouraging that the US claims one of the lowest rates of postsecondary completion among Organisation for Economic Co-operation and Development (OECD) countries. The ratio of four-year college graduates to college entrants was only 57 percent in the US in 2008.[8] Among higher education programs of similar duration across 25 OECD and partner countries, no country's completion rate was lower than ours (Figure 1).[9]

Figure 1: Completion Rates in Postsecondary Programs of 3–6 Years' Duration, 2008



Source: Data from Organisation for Economic Co-operation and Development, *Education at a Glance 2010: OECD Indicators* (Paris: Author, 2010).

What is the OECD?

Established in 1961, the Organisation for Economic Co-operation and Development (OECD) is an intergovernmental organization now comprising 34 member countries. OECD collaborates with governments, business and workforce communities, and other non-profit organizations to develop and suggest research-based policy solutions on a broad array of economic and individual prosperity issues.

Accompanying low rates of US college completion are low levels of K–12 academic performance. The most recent National Assessment of Educational Progress (NAEP) student performance data suggest academic improvement is needed at all grades, but particularly in later grades.[10] While the rate of twelfth-graders (38 percent) who performed at or above the Proficient level in reading was higher than that of fourth-graders (32 percent) and eighth-graders (30 percent) in 2009, this rate remains essentially unchanged since 1992.[11] In mathematics, 26 percent of twelfth-graders performed at or above the Proficient level in 2009.[12] While this rate was 3 percentage points higher than that in 2005, it was also 7 percentage points lower than the Proficient rate for eighth-graders (33 percent) that same year. In a 2009 report, McKinsey & Company noted that if students in states that scored below average on NAEP had improved over 15 years so they merely performed at the national average, the gross domestic product of the US would be 3 to 5 percent higher today, or $425 billion to $700 billion richer.[13] The report concluded that the nation's achievement gaps have imposed "the economic equivalent of a permanent national recession."

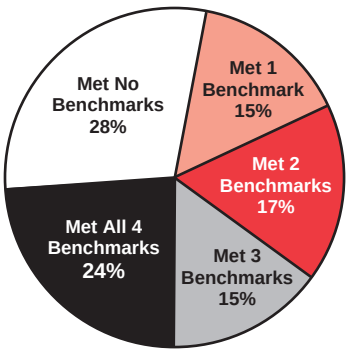
ACT research shows that college readiness is highly related to college completion. Unfortunately, of the 1.5 million 2010 high school graduates who took the ACT® test, only 24 percent met all four College Readiness Benchmarks in English, Mathematics, Reading, and Science—indicating that fewer than 1 in 4 graduates were academically ready for college coursework in all four subject areas without needing remediation (Figure 2). A surprising 28 percent of all 2010 ACT-tested high school graduates met none of the four College Readiness Benchmarks, indicating that they will likely need some form of college remediation in multiple subjects.[14]

An Empirical Performance Standard for College and Career Readiness

Empirically derived from the actual performance of students in college, ACT's College Readiness Benchmarks are the minimum scores required on the ACT subject tests for high school students to have approximately a 75 percent chance of earning a grade of C or better, or a 50 percent chance of earning a grade of B or better, in selected credit-bearing courses commonly taken by first-year college students: English Composition; College Algebra; Biology; and social sciences courses such as History, Psychology, Sociology, Political Science, or Economics.

Data from 98 institutions and more than 90,000 students were used to establish the Benchmarks. The data were weighted to be nationally representative of two- and four-year postsecondary institutions nationwide.

Figure 2: Percentage of 2010 ACT-Tested Graduates Ready for College-Entry, Credit-Bearing Coursework



For US economic and individual prosperity, it is incumbent that the US education system improve the quality of education for its students. The results of the NAEP and ACT studies suggest that the US must make major changes in our education system to ensure that our high school graduates are prepared to succeed either in some form of postsecondary education without remediation or in workforce training programs. As the US economy becomes more globalized, developing an internationally competitive workforce to meet the demands, and benefit from the opportunities, posed by a rapidly evolving global economy is not a luxury. It is an imperative.

The question remains, however, as to whether the skills acquired by college- and career-ready US high school graduates are at a level that enables US graduates to compete in an increasingly global context. In other words, is college and career readiness, which is a new focus of US educational standards, sufficiently rigorous to ensure that our future workforce will be globally competitive?

Are US College and Career Readiness Standards Internationally Competitive?

The Common Core State Standards Initiative that aligns US K–12 education with a uniformly higher standard—college and career readiness—across grades and between K–12 and postsecondary systems is a landmark development for US school reform. Driving the design and development of the Common Core State Standards is the definition of college and career readiness developed and empirically established by ACT. Not only did the Initiative draw on ACT's longitudinal research identifying the knowledge and skills essential for success in postsecondary education and workforce training, but ACT's College Readiness Standards™ were also among the resources used in the creation of the Common Core Standards.

The Common Core State Standards align US K–12 education with the higher standard of college and career readiness—a standard developed and empirically established by ACT.

Adopted as of this writing by 43 states and the District of Columbia, the Common Core State Standards are college and career readiness standards for English language arts (which includes reading) and mathematics, and were created to be internationally competitive. Standards from the highest-performing countries on international assessments such as the Programme for International Student Assessment (PISA) and the Trends in International Mathematics and Science Study (TIMSS) were reviewed in detail and used in the developmental process of the Common Core. International models informed the Common Core State Standards' grade-by-grade progressions, the frameworks within which the Standards reside, and the Common Core's focus in the early grades, especially with respect to procedural fluency integrated with conceptual understanding in mathematics.

But until now, no empirical data have been available to examine whether college and career readiness, as defined in the US, is an internationally competitive standard—that is, whether it represents a level of performance that will be competitive with the highest-performing countries around the world. Is the performance standard associated with college and career readiness equivalent to the performance level of lower-performing countries, average-performing countries, or the highest-performing countries?

This research report focuses on two questions, the results of which will help determine whether college and career readiness is the right goal for US education, and if pursued, whether it is likely to produce high school graduates who can compete with students on an increasingly international stage:

1. *How does the level of achievement defining college and career readiness in reading and mathematics, as measured by ACT College Readiness Benchmarks, compare to the most recent PISA results for the highest-performing countries?*

2. *Are US college and career readiness standards therefore internationally competitive?*

PISA as a Valuable International Link

To answer the questions in this study, ACT performed a linking analysis to identify the PISA scores in reading and mathematics that are equivalent to college- and career-ready reading and mathematics scores on PLAN®, ACT's tenth-grade college and career readiness assessment.[15] Essentially, PISA scores were identified that correspond to the level of achievement needed by tenth-graders on the PLAN assessment to be on target for college and career readiness by the time they graduate from high school. Reading and mathematics were used for the comparison because they are the two subject areas shared in common by PISA, PLAN, and the Common Core State Standards.

PISA was selected as the ideal standardized international academic assessment to use for this study because of its relevance as a measure of international competitiveness. Administered every three years since 2000, PISA is a standardized international assessment measuring 15-year-olds' literacy in reading, mathematics, and science.[16] In 2009, PISA was administered in 65 countries and non-nation economies (hereafter all referred to as countries), including the 34 OECD member nations. As some of the most advanced economies in the world, the OECD members and other participating countries represent the most direct international competitors of the US.

PLAN was selected for the linking analysis because of the similarity of its tested population to that of PISA, its empirically based definition of college and career readiness, and its alignment with standards designed to prepare students for college and career. Approximately 69 percent of the US 15-year-olds who participated in PISA 2009 were in tenth grade; nearly all the remaining 15-year-olds were in grades 9 or 11, with fractional percentages in grades 7, 8, or 12.[17] Through its research, ACT has identified the level of performance needed by US high school graduates in English, mathematics, reading, and science to be ready for first-year credit-bearing college courses in these subjects (see sidebar, page 3). Derived from these nationally validated College Readiness Benchmarks for the ACT, the corresponding College Readiness Benchmarks for PLAN indicate whether students in tenth grade are on target to be ready for credit-bearing college coursework by the time they graduate from high school. All of ACT's college readiness performance standards are aligned with ACT's College Readiness Standards, empirically derived descriptions of the essential skills and knowledge students need to succeed in credit-bearing courses without remediation. In turn, the College Readiness Standards are also highly related to the Common Core State Standards.[18]

Linking PLAN scores to PISA allows us to determine whether college and career readiness is an internationally competitive standard of performance.

Linking PISA to ACT's tenth-grade college and career readiness performance standards allows international comparisons of student performance to be made in reading and mathematics at the most advanced grade level possible today.

Methodology

The linking analysis was based on 2,248 US tenth-grade students from 77 high schools across the US who tested under standardized conditions with both ACT's tenth-grade college readiness assessment and a special administration of PISA that followed the national administration of PISA 2009 in the US. (See the Appendix for more information about the study methodology.) Student subgroups, defined by demographic and school characteristics as well as academic achievement levels, were well represented in this study and are reflective of all US public and private school tenth-graders. By linking the tenth-grade college and career readiness benchmarks to the PISA scale, we are able to evaluate whether the college and career readiness performance standards for US students in these two subjects are competitive with the performance of same-age students in the highest-performing countries globally.

So, how does US college and career readiness in reading and mathematics, as defined within the Common Core State Standards and measured by ACT College Readiness Benchmarks, compare to the PISA 2009 results for the highest-performing countries? Are US college and career readiness standards internationally competitive? That is, as schools educate US students to the new Common Core State Standards, which are predicated on preparing students to be ready for college and career, will that performance standard be sufficiently high for US students to comprise an internationally competitive workforce?

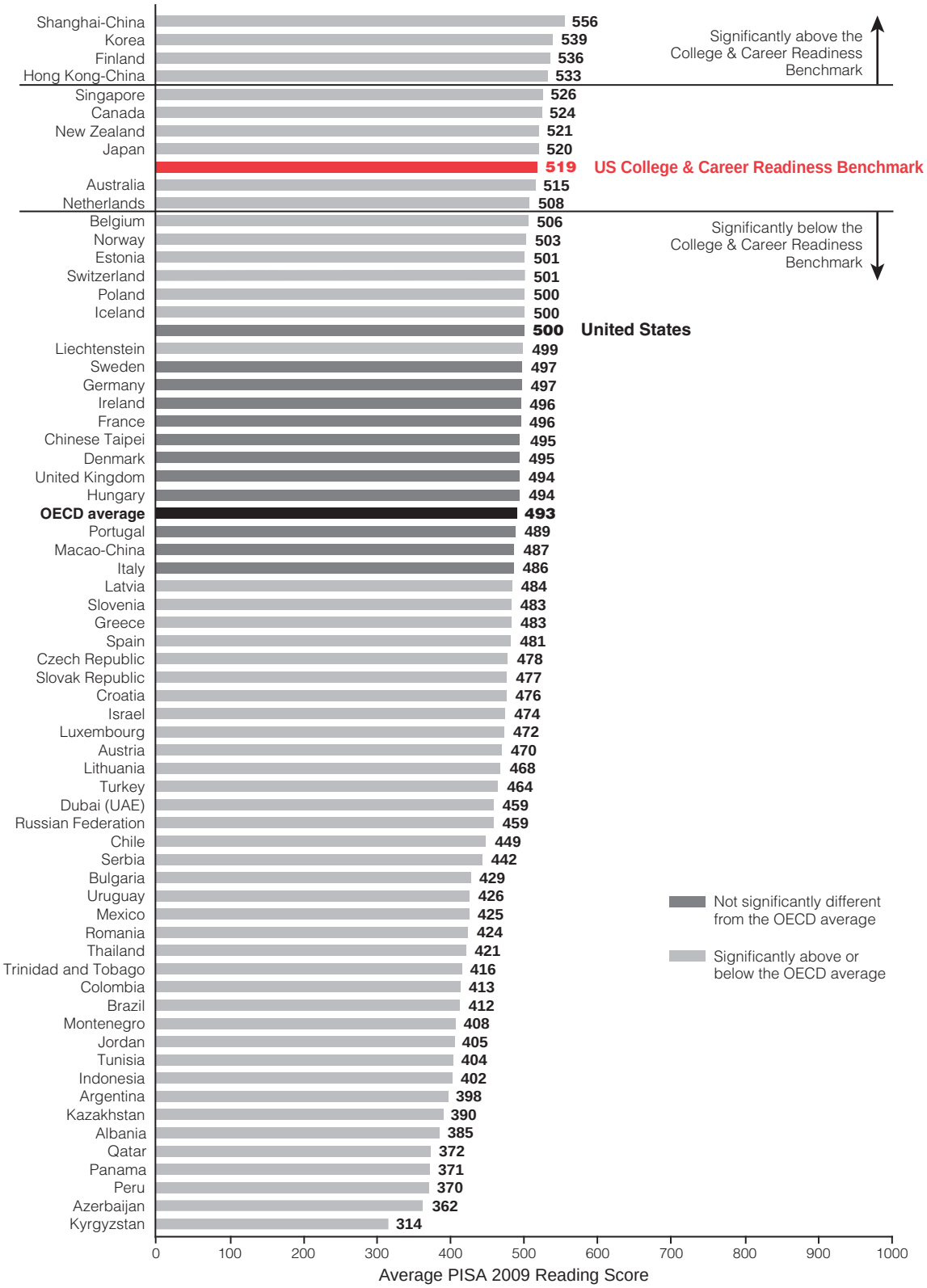
Results

The results of the research show that the performance standards of US college and career readiness in reading and mathematics **are** internationally competitive, and further validate the appropriateness of ACT's definition of college and career readiness as the right goal for US education. Figures 3 and 4, on the following pages, show how the performance standards stack up against the performance of participating countries in reading and mathematics, respectively. The figures also highlight the standing of US performance relative to the college and career readiness standard. In each case, the score given as the college and career readiness benchmark is the PISA score equivalent to the corresponding benchmark score on ACT's tenth-grade college and career readiness assessment.

Figure 3 shows that the tenth-grade college and career readiness benchmark for reading (519) is higher than the OECD average (493) and fell well within the range of the highest-performing countries on PISA Reading. The same is true for the tenth-grade college and career readiness benchmark in mathematics (530) compared to the OECD average (496) and the highest-performing countries on PISA Mathematics (Figure 4).

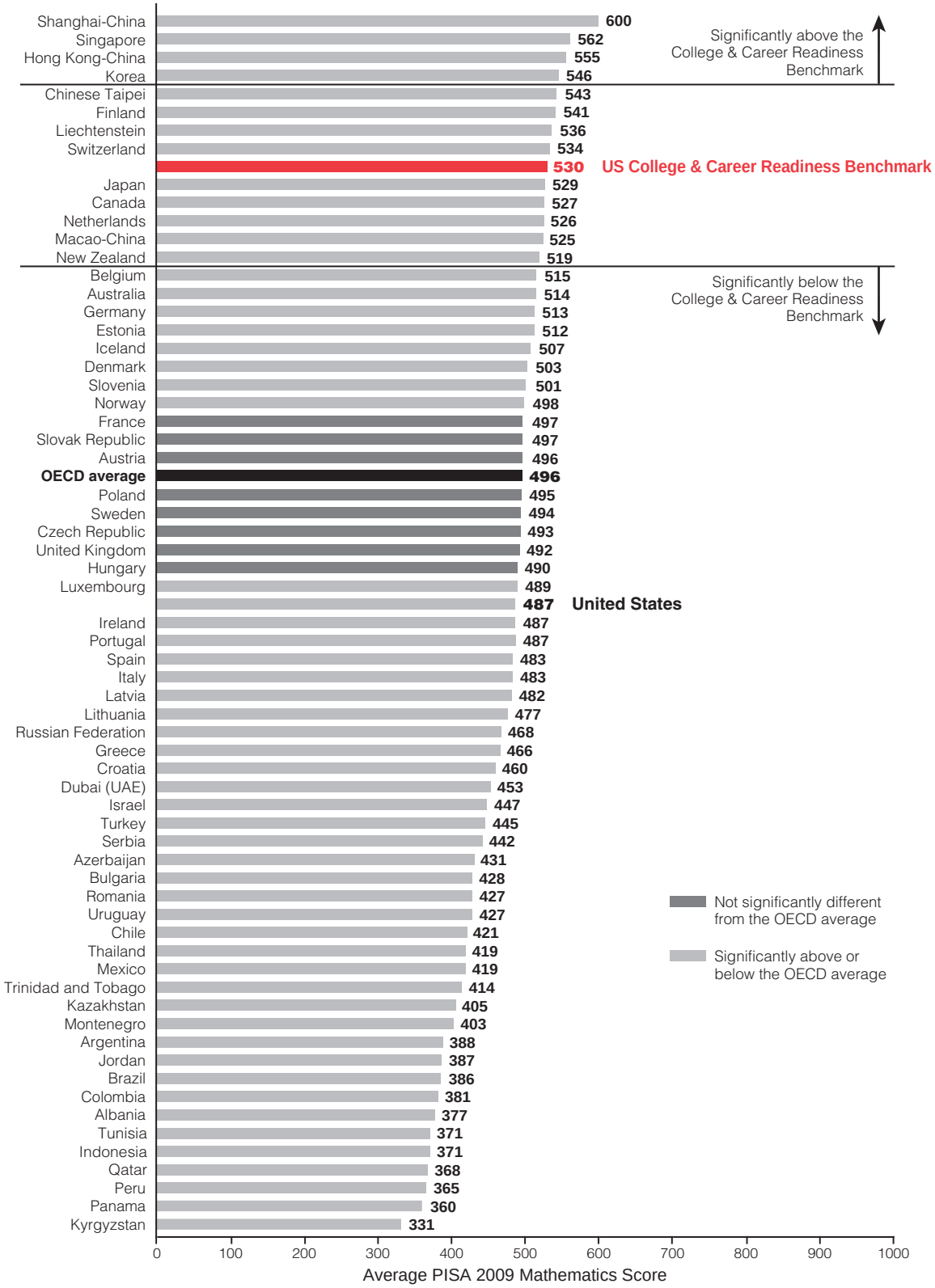
The performance of four countries in reading and four countries in mathematics was statistically significantly higher than the college and career readiness benchmark, while the performance of six countries in reading and nine countries in mathematics was statistically the same as the college and career readiness benchmark.

Figure 3: Tenth-Grade College and Career Readiness Performance Benchmark in Reading Compared to the Performance of Countries on PISA 2009 Reading



Note: With one exception, the data in this figure are from OECD, *PISA 2009 Results: Executive Summary* (Paris: Author, 2010). The US college and career readiness benchmark value is based on ACT analysis.

Figure 4: Tenth-Grade College and Career Readiness Performance Benchmark in Mathematics Compared to the Performance of Countries on PISA 2009 Mathematics



Note: With one exception, the data in this figure are from OECD, *PISA 2009 Results: Executive Summary* (Paris: Author, 2010). The US college and career readiness benchmark value is based on ACT analysis.

Taken together, the figures also show that the US college and career readiness benchmarks are not just internationally competitive but are high and challenging standards on their own. One clear indication of this is that only five countries (Finland, Hong Kong, Korea, Shanghai, and Singapore) met the US college and career standards in **both** reading and mathematics.

Based on the two research questions of this study, the results show:

1. **In both reading and mathematics, the performance standard of college and career readiness in the US—as defined by ACT's College Readiness Benchmarks and as used to develop the Common Core State Standards—is comparable to, and therefore competitive with, the performance of the highest-performing countries in the world.**

2. **Therefore, college and career readiness is an internationally competitive educational standard for the US.**

Why Is It Important that College and Career Readiness Is an Internationally Competitive Performance Standard?

US performance on PISA 2009, the 2009 NAEP, and the most recent (2010) ACT results strongly indicate that reform is needed within the US education system to improve the readiness and competitive position of most US students. Importantly, based on this empirical study, college and career readiness—an internationally competitive, as well as high, standard—is indeed the right goal for the Common Core State Standards and for US education reform efforts more broadly. There are at least five reasons why college and career readiness is the right educational goal for US students.

College and career readiness is the right goal for US education reform.

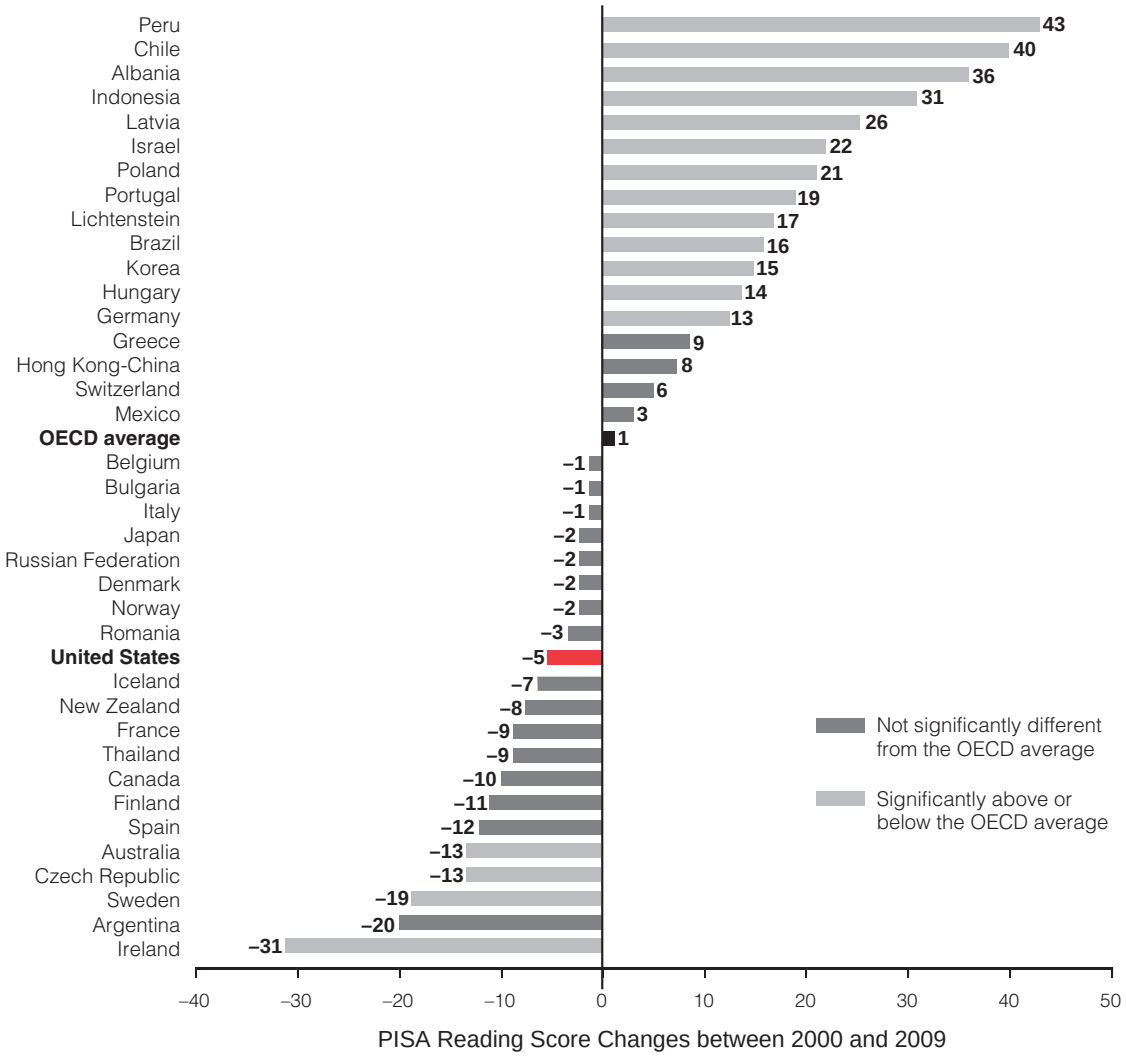
1. **The performance of US students lags significantly behind the performance of students in many other countries.**

   According to the 2009 PISA study (Figures 3 and 4), the performance level of US students is significantly lower than that of students in many other nations. US performance is just slightly above the PISA average performance in reading, but below the average in mathematics.[19] More significantly, US performance in both subjects lags behind that of the highest-performing countries and is significantly below both tenth-grade college and career readiness benchmarks.

2. Furthermore, while many nations show impressive improvements in student performance since 2000, the US does not.

While the US average score changes in reading were essentially unchanged between 2000 and 2009, thirteen countries made significantly higher improvements in student achievement (Figure 5).[20] Korea (increase of 15 PISA score points) and Hong Kong (increase of 8 points), for example, were among the countries that significantly outpaced the US (decrease of 5 points) in reading performance improvement.

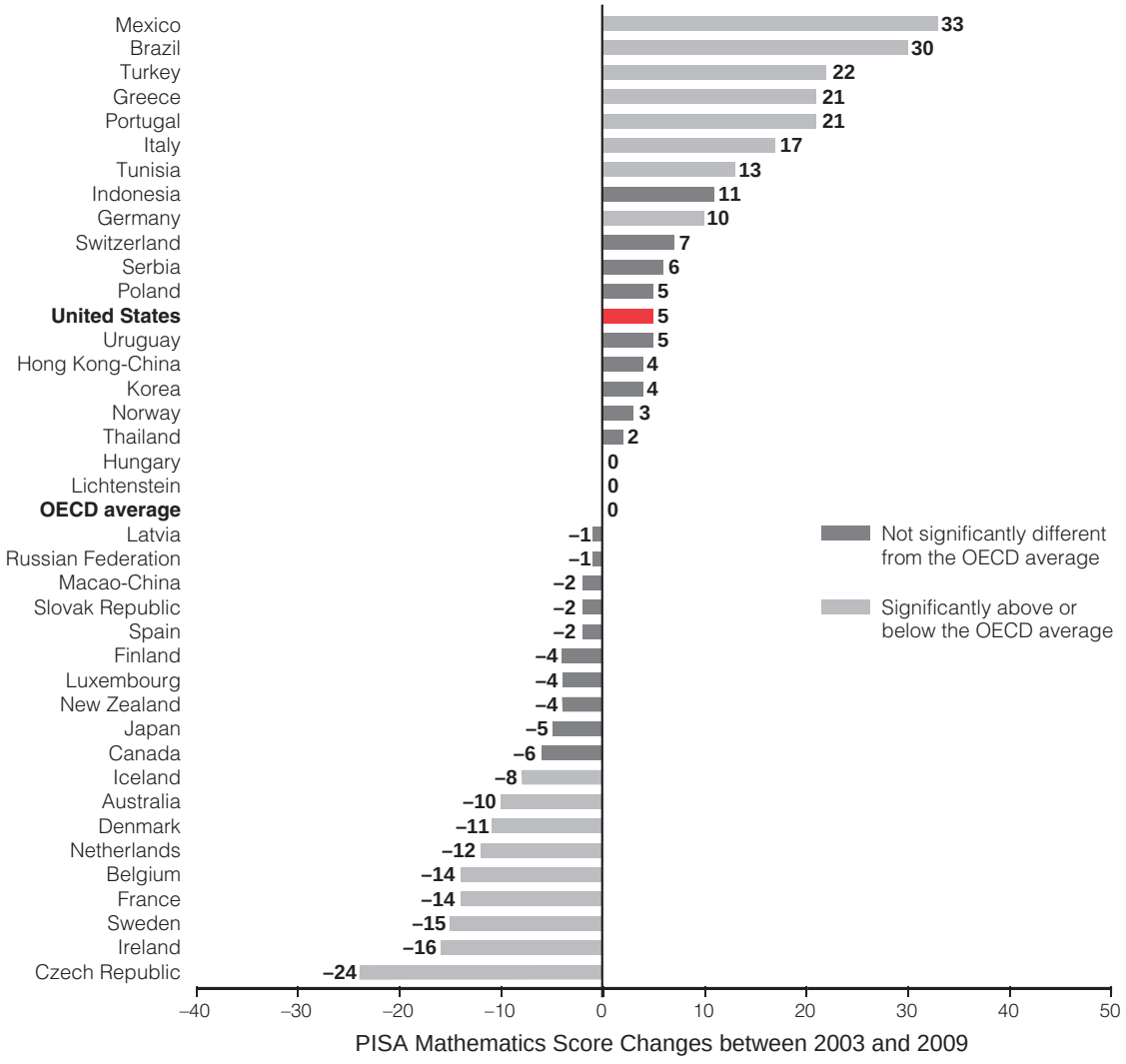
Figure 5: Change in PISA Reading Performance between 2000 and 2009



Source: Data from OECD, *PISA 2009 Results: Learning Trends—Changes in Student Performance Since 2000*, Volume V (Paris: Author, 2010).

Similarly, in mathematics, US performance increased by 5 score points on PISA between 2003 and 2009, which was not significantly different from the trend for the OECD average of no change over the same period (Figure 6).[21] Eight countries showed gains significantly greater than the US or the OECD average, including Germany (increase of 10 score points) and Mexico (increase of 33 points).

Figure 6: Change in PISA Mathematics Performance between 2003 and 2009



Source: Data from OECD, *PISA 2009 Results: Learning Trends—Changes in Student Performance Since 2000*, Volume V (Paris: Author, 2010).

While increasing student performance is challenging, school systems from a wide variety of countries have demonstrated the ability to produce substantial gains in student academic performance. In addition to some lower-performing countries, where large gains might be expected, higher-performing countries have also seen above average performance gains on PISA. A recent McKinsey & Company report analyzing the experiences of twenty school systems from eighteen countries confirms that growth in student academic performance occurs within a wide variety of countries, including sustained improvement within already higher-performing school systems.[22] Lower-performing school systems, such as those in South Africa, Brazil, Chile, India, and Jordan, have demonstrated that initiating growth is possible. Higher-performing school systems, such as those in South Korea, Canada, England, Poland, California, and Massachusetts, have sustained noticeable growth over several years—even decades. The ability of school systems not only to initiate growth but to sustain growth over time appears to be a key factor in improving student academic performance.

3. **Within the US, ACT research has shown that students who are college and career ready when they graduate from high school are more likely to be successful in subsequent college and workforce training programs where they acquire the skills necessary for meeting the demands of a globally competitive labor force.**

ACT has long defined college and career readiness as the acquisition of the knowledge and skills a student needs to enroll and succeed in credit-bearing, first-year courses at a postsecondary institution (such as a two- or four-year college, trade school, or technical school) without remediation. Adopted by the Common Core State Standards Initiative, ACT's definition of college and career readiness is based on years of ACT's empirical research examining the relationship between college readiness and college success, which shows that students who are academically ready for any type of postsecondary education or workforce training have a significantly higher likelihood of:

- enrolling in a postsecondary program,
- enrolling in credit-bearing courses in all subjects without the need for remedial coursework,
- succeeding in postsecondary coursework or training programs,
- persisting in their postsecondary education, and
- completing a postsecondary degree or training program.[23]

In other words, college and career readiness is highly related to and determinative of college and career success.

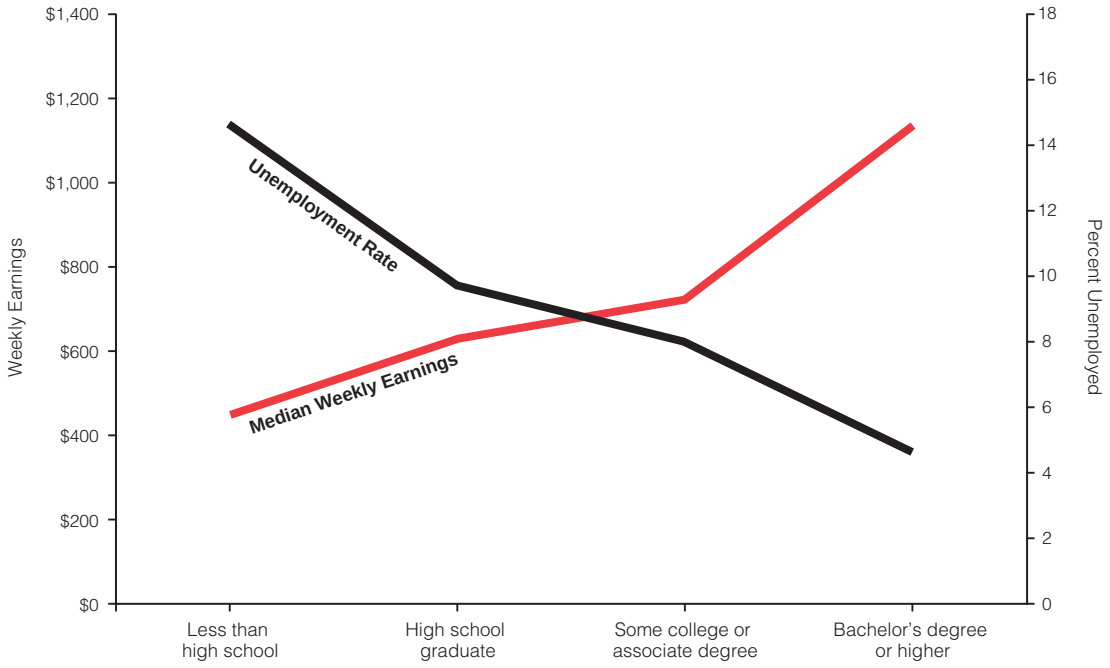
4. As states and districts implement college and career readiness standards, we should expect to see not just increased postsecondary success but also economic payoffs for individuals and the nation.

The economic payoffs of higher levels of educational outcomes are substantial for individuals.[24] For example, higher levels of educational attainment are strongly associated with higher salaries and lower rates of unemployment (Figure 7).[25] With each increase in a level of educational attainment one sees an increase in earnings. Starting from the left of Figure 7 below, one can trace the average earnings (the left-hand scale) of an adult who never finished high school—about $450 per week—up to the earnings of an adult with at least a bachelor's degree—more than $1,100 per week.

Higher levels of educational attainment are strongly associated with higher salaries and lower unemployment.

The relationship between educational attainment and unemployment (the right-hand scale in Figure 7) is just the reverse. As the level of educational attainment rises, the unemployment rate falls. The unemployment rate for an adult who never finished high school approaches 15 percent, while that for a recipient of a bachelor's degree or more hovers just above 4.5 percent. And although

Figure 7: Median Weekly Earnings and Unemployment Rate for US Workers Aged 25 and Older, by Level of Educational Attainment, 2009



Source: Data from U.S. Department of Labor, Bureau of Labor Statistics, *We Don't Need No Education? Think Again! Spotlight on Statistics: Back to School* (Washington, DC: Author, August 2007).

unemployment rates in 2009 were higher overall during the recent economic recession, education-based unemployment differences were even more pronounced within this context. In fact, inequality in economic outcomes based on educational levels has been persistent and increasing over the past 30 years or more.[26]

5. Increasing educational achievement in this country will also have a significant and substantial financial impact on the US economy.[27]

If the US is to increase its global competitiveness, it must develop a highly skilled and adaptable workforce that can meet future productivity demands and take advantage of new opportunities such as trade expansion, applications of new technologies, and new job possibilities. The relationship between acquiring the higher-level skills needed by a competitive workforce and national economic prosperity is substantial and positive.[28] For example, OECD research indicates that increases in PISA scores are associated with increases in national gross domestic product (GDP). According to these projections, if the US could increase its average overall PISA performance by 25 points during the next two decades (comparable to an 11 percentage-point increase in the percentage of PLAN-tested tenth-graders who meet the PLAN College Readiness Benchmarks[29]), US GDP would increase by $40.6 trillion over the lifetime of the generation born in 2010, or approximately $507.5 billion annually.[30] This represents a 3.45 percent increase relative to US GDP in 2010, which was approximately $14.7 trillion.[31] And faster or higher levels of academic improvement would increase GDP by even greater amounts.

Increases in US performance would have a significant impact on national GDP.

Other research supports the principle that improving academic performance will increase annual GDP growth rates, even if by only a few tenths of a percentage point.[32] Boosting the GDP growth rate by such a seemingly small amount actually represents a sizeable increase, considering that US GDP growth since WWII has averaged 3.0 percent annually.[33] Moreover, projected increases in GDP are greater when measures of academic learning are used, rather than simply increasing the number of years that students attend school. Increasing students' knowledge and skills increases GDP at higher rates than does simply increasing the length of time students spend in school without ensuring the curriculum is suitable for preparing students for college and career. As more US high school graduates become ready for college and career, thereby acquiring the skills necessary to compete in the global economy, it is a virtual certainty that US economic output will increase and the US economic competitive position will be strengthened.

What are the Implications of College and Career Readiness as an Internationally Competitive Performance Standard?

The goal of ensuring that all high school graduates are ready for college and career is the right one for the US.

Reform efforts such as the internationally benchmarked Common Core State Standards, which align US K–12 education standards across grades and to US postsecondary expectations, should be supported as an essential step in increasing the college and career readiness of US high school graduates. Students who achieve the goal of becoming college and career ready are likely to be academically competitive with students from the highest-performing countries in the world. Such empirical evidence of international competitiveness affirming that college and career readiness is the right goal cannot be understated. Getting the educational goal right is fundamental to successfully reforming US education so that the US and its citizens can remain economically competitive. The relationships among skills development, workforce productivity, and economic growth demand that high school graduates be college and career ready so that they can acquire the skills and knowledge they will need to meet the demands of the changing global economy. College and career readiness is an essential step for the longer-term economic viability of the US.

College and career readiness is an essential step for the longer-term economic viablility of the US.

The college and career readiness performance standard is competitive with the most recent PISA results of the highest-performing countries.

Educational standards, such as the Common Core State Standards, that have college and career readiness as their foundation and were designed to be internationally benchmarked now have empirical evidence that, if implemented effectively, they will result in a level of performance that is internationally competitive. As states adopt and implement the Common Core, students within these states will benefit knowing that the education standards they are being asked to meet—the learning in which they will engage—will adequately prepare them for their future educational and career pursuits within an increasingly global context. K–12 students will no longer have educational expectations placed upon them that are insufficient to meet the demands of a global economy in the 21st century.

Public support for states and schools that undertake such an ambitious innovation of their education system will be a critical element of successful reform.

While adopting internationally benchmarked standards such as the Common Core is an important first step, other critical steps remain—alignment of curriculum, instructional tools, teacher training and professional development, and assessments—to ensure that all students become college and career ready. As states implement the Common Core State Standards, educators and policymakers must also engage community stakeholders to broaden their understanding of why such standards are essential; what shifting to a college and career readiness standard means for students, parents, and schools; how these challenging expectations will change other aspects of schooling; and in what ways individuals, groups, and communities can be supportive of implementation efforts. The adoption of internationally benchmarked college and career readiness standards represents a fundamental shift in expectations of students and school systems. Such a significant shift in standards will necessitate a concomitant shift in understanding for students, parents, educators, and other stakeholders as to what an acceptable level of student performance is, relative to becoming college and career ready and internationally competitive. Previous levels of student performance deemed acceptable for passing classes, matriculation, and graduation, but based on education standards not internationally benchmarked and not aligned to college and career readiness, will no longer be sufficient for preparing students for the challenges and opportunities ahead.

ACT research suggests that the desired outcome of these changes—higher percentages of college- and career-ready high school graduates—will not happen overnight and will take time. A recent Center on Education Policy survey of deputy superintendents of education in 42 states and the District of Columbia indicates that the resulting changes in curriculum; instructional tools; teacher professional training, certification, and development programs; and assessments will occur over the next three years or more.[34] Most states that have already adopted the Common Core State Standards expect to make changes to teacher professional development programs in 2011. Many of the same states, however, indicate that changes to curriculum, instructional tools, and teacher training and evaluation will not be fully implemented until 2013 or later. Seeing the results of these efforts—increased numbers of high school graduates who are indeed college and career ready—will take even more time. State, school, and district educators must be allowed time to implement the changes necessitated by raising education standards to college and career readiness and to see the results of those reform efforts.

Conclusion

While the PISA 2009 results signal that much work remains to raise current US student performance to be competitive with that of students from the highest-performing countries, this study empirically affirms that the heart of current education reform in the US—the goal of college and career readiness for all students—is the right goal for these efforts. Ensuring that students are college and career ready will effectively put US students on the path toward being internationally competitive with students from the world's highest-performing countries. Affirming the goal is a critical first step in confirming that current education reform efforts hold great promise for producing the intended results.

Policymakers and educators at all levels now have evidence from an international perspective for engaging in reform efforts to help all students become ready for college and career. As shown by the nearly 1 in 4 high school graduates who met this goal in English, mathematics, reading, and science in 2010, and the approximately 72 percent of all 2010 graduates who did so in at least one subject, meeting such a goal is challenging, but possible. It is being done today by schools all across the nation.

ACT believes that a comprehensive approach to educational reform, such as Common Core implementation, that incorporates essential changes in practice and policy is imperative for turning the promise of college and career readiness into a reality for **all** our students.

For our students and the nation, the goal is the right one.

For all of us, the time to begin is now.

Appendix

Sample

For the linking analysis, 2,248 students from 77 schools were tested with both ACT's tenth-grade college and career readiness assessment (PLAN) and the special administration of PISA. Students were weighted to account for the number of students tested per school. The criteria for a high school to be included as a candidate to participate in the 2009 PLAN-PISA study were: 1) the high school must have tested at least 30 tenth-grade students with PLAN in fall 2008; 2) the high school must have tested at least 75 percent of its tenth-grade students with PLAN in fall 2008; 3) the high school must have an average grade level enrollment of at least 40 students; and 4) the high school must not have participated in the national administration of PISA 2009. Schools were selected with probability proportional to size, and a random sample of students in the correct age range was chosen. Students in this study were born between September 1, 1993, and August 31, 1994. Note that this differs slightly from the age range used in the operational PISA testing, and was used to account for the difference in the timing of the tests.

Table 1 presents a comparison of demographic information between the weighted study sample and the US population of tenth-graders. Generally, the weighted study sample and US population are similar across school type, race/ethnicity, and PLAN College Readiness

Table 1. Summary Comparison of the Study Sample and the 15-Year-Old, 16-Year-Old, and Tenth-Grade US Populations

Characteristic		Weighted Study Sample	US Population (15- and 16-year-olds; tenth-graders) 1
School Type	Public	90.9%	92.6% [2]
	Private/Catholic	9.1%	7.4% [2]
Gender	Female	54.7%	48.8%
	Male	45.3%	51.2%
	Unknown	0%	0%
Race/Ethnicity	Hispanic	6.8%	9.0%
	White	70.3%	68.0%
	Black	10.8%	15.7%
	Asian	1.4%	3.9%
	Other	4.8%	3.6%
	Unknown	5.9%	0%
Attainment PLAN Benchmark	Reading	56%	50% [3]
	Mathematics	42%	34% [3]

1 Statistics from the U.S. Census Bureau's American Community Survey unless otherwise noted.
2 Calculated from Market Data Retrieval database.
3 Based on the PLAN 2005 National Norms for Fall Grade 10.

Benchmark attainment levels. The proportion of females to males is higher in the weighted study sample than in the comparison US population. Additionally, the percentage of students in the weighted study sample who met the PLAN College Readiness Benchmarks was slightly higher in the two subjects—6 percentage points in Reading and 8 percentage points in Mathematics.

Table 2 compares the PLAN and PISA average scores between the study sample and the broader PLAN and PISA US populations, respectively. Mean scores on PLAN and PISA were slightly higher for the weighted study sample than for the two comparison groups. On average, the study sample was about 0.2 to 0.3 standard deviations higher than both the PLAN norm and the USA PISA 2009 sample. Since each College Readiness Benchmark is on the higher end of the PLAN scale, this difference does not have a significant impact on the PISA concordant score at a benchmark. Additional linking validations have also shown that linkages derived from publicly available data did not differ from the linkages derived from the study sample.

Table 2. Academic Achievement of the Study Sample and the PLAN and PISA 2009 US Samples

Assessment	Weighted Study Sample	Grade 10 PLAN 2005 Norm Sample	US PISA 2009 Sample
PLAN Reading	17.9	16.9	——
PLAN Mathematics	18.8	17.4	——
PISA Reading	521	——	500
PISA Mathematics	507	——	487

Method

Students in the study sample took the PLAN assessment under standard operational conditions during the 2009 fall semester. The special administration of the PISA assessment occurred in December 2009 and January 2010, following the national administration of PISA 2009 in the US. Each student was administered one PISA booklet and one PLAN assessment battery. The two score distributions were then linked using an unsmoothed equipercentile concordance method.

Note that for the PISA assessment, there is no single score for each subject but a set of plausible values. Five plausible score values were generated for each student. Plausible values were used as a set to create a distribution of PISA scores. For each subject, the linking was conducted five times, each using a different set of plausible values. The final reported concordance was the arithmetic average of the five linking scores at each PLAN score point.

Linkage Validation

Because of the differences between the sample and the population, a series of cross-validation studies of the linkage was conducted, and additional linkages were created using publicly available PISA and PLAN data. Linkages from these additional sources were consistent with the current study results.

Publicly available PISA assessment data for three previous testing cycles—2003, 2006, and 2009—were used in the cross-validation process. Publicly available PLAN data came from the score distribution for the national norming conducted in fall 2005 for Grade 10. For cross-validation purposes, the following linkages were made between PISA and PLAN:

- PISA 2003 to PLAN 2005 norm
- PISA 2006 to PLAN 2005 norm
- PISA 2009 to PLAN 2005 norm

Additional technical documentation concerning this study is found in the study's technical manual.[35]

Endnotes

1 Ben S. Bernanke, *Trade and Jobs* (speech, Fuqua School of Business, Duke University, Durham, NC, March 2004), accessed January 5, 2011, http://www.federalreserve.gov/boarddocs/speeches/2004/20040330/default.htm; World Economic Forum, *The Global Competitiveness Report, 2010–2011* (Switzerland: Author, 2010).

2 See, for example, American Society for Training & Development, *Bridging the Skills Gap: How the Skills Shortage Threatens Growth and Competitiveness … and What To Do About It* (Alexandria, VA: Author, 2006); Ben S. Bernanke, *Education and Economic Competitiveness* (speech, U.S. Chamber Education and Workforce Summit, Washington, DC, September 2009), accessed January 5, 2011, http://www.federalreserve.gov/newsevents/speech/bernanke20070924a.htm#f4

3 Organisation for Economic Co-operation and Development, *Strong Performers and Successful Reformers in Education: Lessons from PISA for the United States* (2010), accessed December 28, 2010, http://www.oecd.org/dataoecd/32/50/46623978.pdf; Organisation for Economic Co-operation and Development, *The High Cost of Low Educational Performance: The Long-Run Economic Impact of Improving PISA Outcomes* (Paris: Author, 2010).

4 Bernanke, *Education and Economic Competitiveness*; U.S. Department of Labor, Bureau of Labor Statistics, *Preliminary Multifactor Productivity Trends* (2007), accessed January 5, 2011, www.bls.gov/news.release/prod3.nr0.htm.

5 U.S. Department of Labor, Bureau of Labor Statistics, *The Occupational Outlook Handbook, 2010–11 Edition* (2010), accessed February 8, 2011, http://www.bls.gov/oco/

6 See, for example, Council on Competitiveness, *Competitive Index: Where America Stands* (Washington, DC: Author, 2007); National Center on Education and the Economy, *Tough Choices or Tough Times: The Report of the New Commission on the Skills of the American Workforce, Revised and Expanded Edition* (San Francisco: Jossey-Bass, 2008); National Academy of Sciences, National Academy of Engineers, and Institute of Medicine of the National Academies, *Rising Above the Gathering Storm, Revisited: Rapidly Approaching Category 5* (Washington, DC: The National Academies Press, 2010); National Academy of Sciences, National Academy of Engineers, and Institute of Medicine of the National Academies, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future* (Washington, DC: The National Academies Press, 2007); National Governors Association, Council of Chief State School Officers, and Achieve, Inc., *Benchmarking for Success: Ensuring U.S. Students Receive a World-Class Education* (Washington, DC: Authors, 2008).

7 See, for example, Daron Acemoglu and Joshua Angist, "How Large Are Human Capital Externalities? Evidence from Compulsory Schooling Laws," in *NBER Macroeconomics Annual*, ed. Ben S. Bernanke and Kenneth Rogoff (Cambridge, MA: MIT Press, 2001): 9–59; Gary S. Becker, *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education* (New York: National Bureau of Economic Research, 1964); Bernanke, *Education and Economic Competitiveness*; David Card, "The Causal Effect of Education on Earnings," in *Handbook of Labor Economics, Volume 3A*, ed. Orley Ashenfelter

and David Card (Amsterdam: Elsevier, 1999): 1801–1863; Eric A. Hanushek and Ludger Woessmann, "Education and Economic Growth," in *Economics of Education*, ed. Dominic J. Brewer and Patrick J. McEwan (Amsterdam: Elsevier, 2010): 60-67; Organisation for Economic Co-operation and Development, *The High Cost of Low Educational Performance: The Long-Run Economic Impact of Improving PISA Outcomes*, Table 1 (Paris: Author, 2010); Robert Topel, "The Private and Social Values of Education," in *Handbook of Labor Economics, Volume 3C*, ed. Orley Ashenfelter and David Card (Amsterdam: Elsevier, 1999): 2944–2984; U.S. Department of Labor, Bureau of Labor Statistics, *Preliminary Multifactor Productivity Trends* (2007), accessed January 5, 2011, www.bls.gov/news.release/prod3.nr0.htm

8 Organisation for Economic Co-operation and Development, *Education at a Glance 2010: OECD Indicators* (Paris: Author, 2010).

9 Valuable cautions on this type of comparison can be found in Clifford Adelman, "The Propaganda of International Comparisons," *Inside Higher Ed*, December 15, 2008, accessed March 15, 2011, http://www.insidehighered.com/layout/set.print/views/2008/12/15/adelman; Jane V. Wellman, *Apples and Oranges in the Flat World: A Layperson's Guide to International Comparisons of Postsecondary Education* (Washington, DC: American Council on Education, Center for Policy Analysis, & Center for International Initiatives, 2007).

10 National Center for Education Statistics, *The Nation's Report Card: Grade 12 Reading and Mathematics 2009 National and Pilot State Results* (Washington, DC: Institute of Education Sciences, U.S. Department of Education, 2010).

11 National Center for Education Statistics, *The Nation's Report Card: Grade 12 Reading and Mathematics*; National Center for Education Statistics, *The Nation's Report Card: Reading 2009* (Washington, DC: Institute of Education Sciences, U.S. Department of Education, 2009).

12 National Center for Education Statistics, *The Nation's Report Card: Grade 12 Reading and Mathematics*; National Center for Education Statistics, *The Nation's Report Card: Mathematics 2009* (Washington, DC: Institute of Education Sciences, U.S. Department of Education, 2009).

13 McKinsey & Company, *The Economic Impact of the Achievement Gap in America's Schools*, p. 6 (2009), accessed February 23, 2011, http://www.mckinsey.com/app_media/images/page_images/offices/socialsector/pdf/achievement_gap_report.pdf

14 ACT, *The Condition of College and Career Readiness 2010* (Iowa City, IA: Author, 2010).

15 For additional information on PLAN, please see: ACT, *PLAN Technical Manual* (2007), available at http://www.act.org/plan/pdf/ PlanTechnicalManual.pdf

16 PISA results are reported using score scales established by OECD to have a range of 0 to 1000, an average score of 500 points, and a standard deviation of 100 points Organisation for Economic Co-operation and Development, *PISA 2009 Assessment Framework: Key Competencies in Reading, Mathematics and Science* (2009), accessed December 22, 2010, http://www.oecd.org/dataoecd/11/40/44455820.pdf

17 Howard L. Fleischman, Paul J. Hopstock, Marisa P. Pelczar, and Brooke E. Shelley, *Highlights from PISA 2009: Performance of U.S. 15-Year-Old Students in Reading, Mathematics, and Science Literacy in an International Context* (Washington, DC: U.S. Department of Education, National Center for Education Statistics, 2010).

18 ACT, *The Alignment of Common Core and ACT's College and Career Readiness System* (2010), accessed February 8, 2011, http://www.act.org/commoncore/

19 Organisation for Economic Co-operation and Development, *PISA 2009 Results: Executive Summary* (Paris: Author, 2010).

20 Organisation for Economic Co-operation and Development, *PISA 2009 Results: Learning Trends—Changes in Student Performance Since 2000, Volume V* (Paris: Author, 2010).

21 Organisation for Economic Co-operation and Development, *PISA 2009 Results: Learning Trends—Changes in Student Performance Since 2000, Volume V* (Paris: Author, 2010).

22 Mona Mourshed, Chinezi Chijioke, and Michael Barber, *How the World's Most Improved School Systems Keep Getting Better* (2010), accessed January 27, 2011, http://www.mckinsey.com/clientservice/Social_Sector/our_practices/Education/Knowledge_Highlights/How%20School%20Systems%20Get%20Better.aspx

23 ACT, *What We Know About College Success: Using ACT Data to Inform Educational Issues* (Iowa City, IA: Author, 2008).

24 See, for example, Ben S. Bernanke, *Trade and Jobs* (speech, Fuqua School of Business, Duke University, Durham, NC, March 2004), accessed January 5, 2011, http://www.federalreserve.gov/boarddocs/speeches/2004/20040330/default.htm; David Card, "The Causal Effect of Education on Earnings," in *Handbook of Labor Economics*, Volume 3A, ed. Orley Ashenfelter and David Card (Amsterdam: Elsevier, 1999): 1801–1863.

25 U.S. Department of Labor, Bureau of Labor Statistics, *We Don't Need No Education? Think Again! Spotlight on Statistics: Back to School* (2007, August), accessed July 29, 2008, http://www.bls.gov/spotlight/2007/back%5Fto%5Fschool/

26 Ben S. Bernanke, *The Level and Distribution of Economic Well-Being* (speech, greater Omaha Chamber of Commerce, Omaha, NE, February 2007), accessed January 5, 2011, http://www.federalreserve.gov/newsevents/speech/bernanke20070206a.htm

27 See, for example, Daron Acemoglu and Joshua Angist, "How Large Are Human Capital Externalities? Evidence from Compulsory Schooling Laws," in *NBER Macroeconomics Annual*, ed. Ben S. Bernanke and Kenneth Rogoff (Cambridge, MA: MIT Press, 2001): 9–59; Gary S. Becker, *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education* (New York: National Bureau of Economic Research, 1964); David Card, "The Causal Effect of Education on Earnings," in *Handbook of Labor Economics, Volume 3A*, ed. Orley Ashenfelter and David Card (Amsterdam: Elsevier, 1999): 1801–1863.

28 Eric A. Hanushek and Ludger Woessmann, "Education and Economic Growth," in *Economics of Education*, ed. Dominic J. Brewer and Patrick J. McEwan (Amsterdam: Elsevier, 2010): 60-67; Robert Topel, "The Private and Social Values of Education," in *Handbook of Labor Economics*, Volume 3C, ed. Orley Ashenfelter and David Card (Amsterdam: Elsevier, 1999): 2944–2984.

29 These are estimates of the increase in the percentage of students meeting the PLAN College Readiness Benchmarks comparable to 25-point increases in mean PISA scores. Estimates were derived by shifting the PLAN score distribution (using the 2005 PLAN norms) by the number of PLAN score units related to a 25-point increase in PISA scores. Standard deviations of PLAN and PISA scores in the US population were used to relate the 25-point PISA shifts to comparable PLAN shifts.

30 Organisation for Economic Co-operation and Development, *The High Cost of Low Educational Performance: The Long-Run Economic Impact of Improving PISA Outcomes*, Table 1 (Paris: Author, 2010).

31 Bureau of Economic Analysis, U.S. Department of Commerce, *Gross Domestic Product: Fourth Quarter and Annual 2010 (Advance Estimate)* (2011), accessed February 10, 2011, http://www.bea.gov/newsreleases/national/gdp/2011/pdf/gdp4q10_adv.pdf

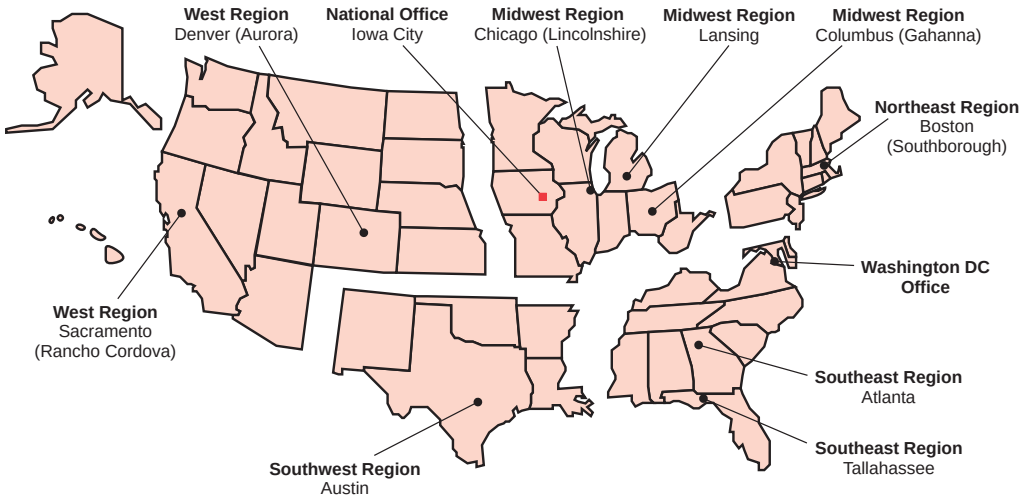
32 See, for example, Eric A. Hanushek, Dean T. Jamison, Eliot A. Jamison, and Ludger Woessmann, "Education and Economic Growth: It's Not Just Going to School, But Learning Something While There That Matters," *Education Next* 8, no. 2 (Spring 2008): 62–70; Eric A. Hanushek and Ludger Woessmann, "Education and Economic Growth," in *Economics of Education*, ed. Dominic J. Brewer and Patrick J. McEwan (Amsterdam: Elsevier, 2010): 60-67; Eric A. Hanushek and Ludger Woessmann, *Education Quality and Economic Growth* (Washington, DC: World Bank, 2007).

33 Bureau of Economic Analysis, U.S. Department of Commerce, *Gross Domestic Product: Percent Change From Preceding Period* (2011), accessed February 10, 2011, http://www.bea.gov/national/index.htm#gdp

34 Nancy Kober and Diane Stark Rentner, *States' Progress and Challenges in Implementing Common Core State Standards* (Washington, DC: Center on Education Policy, 2011).

35 ACT, *Technical Manual for the PLAN-PISA International Benchmarking Linking Study* (Iowa City, IA: Author, 2010).

ACT Offices



ACT National Office
500 ACT Drive
P.O. Box 168
Iowa City, Iowa 52243-0168
Telephone: 319/337-1000

Washington, DC Office
One Dupont Circle N.W.
Suite 340
Washington, DC 20036-1170
Telephone: 202/223-2318

West Region

Denver Office
3131 South Vaughn Way
Suite 218
Aurora, Colorado 80014-3507
Telephone: 303/337-3273

Sacramento Office
2880 Sunrise Boulevard
Suite 214
Rancho Cordova, California 95742-6103
Telephone: 916/631-9200

Midwest Region

Chicago Office
300 Knightsbridge Parkway
Suite 300
Lincolnshire, Illinois 60069-9498
Telephone: 847/634-2560

Columbus Office
700 Taylor Road
Suite 210
Gahanna, Ohio 43230-3318
Telephone: 614/470-9828

Michigan Office
1001 Centennial Way
Suite 400
Lansing, Michigan 48917-8249
Telephone: 517/327-5919

Southwest Region

Austin Office
8701 MoPac Expressway North
Suite 200
Austin, Texas 78759-8364
Telephone: 512/320-1850

Northeast Region

Boston Office
144 Turnpike Road
Suite 370
Southborough, Massachusetts 01772-2121
Telephone: 508/229-0111

Southeast Region

Atlanta Office
3355 Lenox Road N.E.
Suite 320
Atlanta, Georgia 30326-1332
Telephone: 404/231-1952

Florida Office
1315 East Lafayette Street
Suite A
Tallahassee, Florida 32301-4757
Telephone: 850/878-2729

ACT®

500 ACT Drive
P.O. Box 168
Iowa City, Iowa 52243-0168
www.act.org

* 0 1 1 7 0 1 1 1 0 *

Rev 1 16310