



# COLLEGE READINESS

EDUCATION CHANGES LIVES.  
PEARSON IS COMMITTED TO IMPROVING LIVES AROUND  
THE GLOBE THROUGH EDUCATION. WE ARE PARTNERS  
WITH EDUCATORS, GOVERNMENT AND POLICY LEADERS,  
AND THE PUBLIC IN ADDRESSING EDUCATIONAL  
CHALLENGES AND DEVELOPING EFFECTIVE SOLUTIONS.

In our conversations with key shareholders across the U.S., we have recognized four recurring topics that we are now examining in issues papers to take a deeper look at the underlying research around these areas and to help define solutions that are making a difference. These themes—College Readiness, Teaching Quality, Assessment for Learning, and Technology and Educational Achievement—have significant implications for the future prosperity of the United States.

These issues papers are not intended to be an exhaustive overview of the current state of American education. Rather, they will outline the issues and associated challenges, and point to potential solutions that have exhibited demonstrable results.

The papers will offer the reader—whether a legislator, administrator, school board member, teacher, or parent—a scan of the existing literature and a perspective on approaches that have demonstrated progress. For example, the discussion about teaching quality, perhaps the single most significant variable that influences student achievement, will consider the return on an investment in effective teaching and professional development. The “Assessment for Learning” paper will define the role of classroom assessment and how the various types of assessments, when leveraged by a teacher, inform instruction and personalize learning for a student. The technology paper will broaden the dialogue on the potential efficacy and efficiency that can be harnessed with the latest advances in learning science and enterprise resources.

This particular paper examines college readiness, one of America’s fundamental educational challenges. College readiness involves multiple factors that contribute to

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the intellectual, emotional, informational, and financial wherewithal required to attend and succeed in higher education. For the purposes of this paper, our focus will be on one piece of this complex subject: math. However, there are many factors associated with a person's readiness for higher education, from literacy to 21st-century skills that span the entire curriculum of high school preparation and higher education.

We are not explicitly addressing workplace readiness in this paper. Much of the research on college and workplace readiness points to a very similar skill set and knowledge base required for success at either work or in college. Our focus here will be specifically on college readiness but the evidence is that the issues are related and that remediation approaches are similar.

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## COLLEGEREADINESS:

### The Basic Building Blocks of College Access and Success

#### Introduction

The ability to achieve a college education, with its associated upward financial mobility, is a uniquely American ideal that has been at the heart of our nation's economic success. This is particularly true of the last half of the 20th century, when United State's commitment to higher education increased with the GI Bill and the growth and expansion of community colleges and public universities.

The expectation that everyone could participate in higher education, however, has been frustrated in recent times, as evidenced by increasing high school drop-out rates and the lack of preparedness for higher education among those who do graduate from high school. The economic consequences are staggering—more than \$1.4 billion a year is spent on remedial courses at community colleges alone. The current generation is the first that will be less educated, in terms of the average number of years of education, than the previous generation. We are failing to reach goals that are both part of our heritage and vital to a well-informed and productive citizenry.

**IN TODAY'S ECONOMY,** a college degree is increasingly becoming a basic requirement. "An estimated 85 percent of current jobs and almost 90 percent of the fastest-growing and best-paying jobs now require some postsecondary education," according to the Business-Higher Education Forum and U.S. Department of Labor.

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## COLLEGEREADINESS:

### What We Know

#### Problem Defined

The term *college readiness* would seem to be self-explanatory, but experts differ on what exactly it should mean and how it should be measured. There is little disagreement among experts, however, on the larger points. American high schools are failing to carry out one of their primary responsibilities: to prepare young people—especially,

but not exclusively, low-income and minority students—to enroll *and* succeed in college. Specifically, most students are leaving high school without the rigorous academic preparation necessary for success in college. The good news is that the general lack of college readiness is reversible: research provides evidence of interventions and approaches that can properly prepare students for college success.

Many young people in the United States lack the basic qualifications necessary to get into college. Right out of the gate, roughly a third of the high school-age population is not ready for college because they fail to graduate on time. They are, for the most part, condemned to “wander through life like lost travelers, without guidance or goals.”<sup>1</sup> For the rest—namely, those who graduate and those who complete a college-preparatory curriculum—college readiness and success are not guaranteed.

In particular, fewer than half of those who graduate “leave high school with the bare minimum qualifications necessary to apply” to a four-year college, according to a recent Manhattan Institute for Policy Research study funded by the Bill and Melinda Gates Foundation.<sup>2</sup> Adopting a more stringent definition of “college-ready,” ACT, Inc., which develops the ACT college admissions test, found that only about one in four test-takers who were graduating *and* had completed a core curriculum were ready for entry-level college courses.<sup>3</sup>

**Recently, the Strong American Schools campaign—a project of the Rockefeller Philanthropy Advisors, the Bill and Melinda Gates Foundation, and the Eli and Edythe Broad Foundation—weighed in with its own take on college readiness:**

**The best measure of student readiness for college is not the percentage of high school graduates who obtain admission. ... The far better measure *is how well high school graduates actually perform in college. Do students pass university-level math and English classes? Do they receive a college diploma?* [Emphasis added]<sup>4</sup>**

Based on college graduation rates, the nation’s schools indeed are doing a poor job. For example, less than a third of all eighth graders achieve college readiness, given a college graduation rate of 29 percent, the campaign’s recently published *Diploma to Nowhere* reported.<sup>5</sup> Among students who make it to college, completion is far from assured. Only a third of students who attend two-year colleges graduate within three years, and just 56 percent of students who attend four-year institutions graduate within six years.<sup>6</sup>

Finally, the vast number of college students who take remedial courses is a clear and unambiguous sign that college readiness is a problem. Consider the remediation rates for *beginning* college students: according to a 2008 U.S. Department of Education report, 21 percent of all entering freshmen reported taking at least one remedial course.<sup>7</sup>

In several states, remediation rates for *entering freshmen* are significantly higher. For example, more than 60 percent of the freshmen who enroll every year in the California State University system—the nation’s largest—take remedial courses, *Diploma to Nowhere* reported.<sup>8</sup> Other states reporting high remediation rates among entering freshmen or recent high school graduates include: Colorado (30 percent), Kentucky (53 percent), Maryland (48 percent), Missouri (36 percent), Ohio (37 percent), and Oklahoma (36 percent).<sup>9</sup>

**Remediation rates for all college students are equally grim. More than a third (34 percent) of all undergraduates in the United States reported having taken a remedial course, according to recent analysis of 2004 Department of Education data.<sup>10</sup> When broken down by institution type, the rates present a bleaker picture:**

**43 percent of those attending public two-year institutions  
29 percent of those attending public four-year institutions<sup>11</sup>**

Several states have reported significantly higher remediation rates for their public two-year institutions. In 2006, about 8 in 10 students enrolling in Florida’s community colleges required remediation—two-thirds of them took remedial courses in multiple subjects.<sup>12</sup> Similarly, 70 percent of Indiana’s community college student population and more than 80 percent of Oklahoma’s required remediation in recent years.<sup>13</sup>

### **COLLEGE READINESS IS ESPECIALLY**

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### **College Readiness Patterns**

College readiness is especially problematic for students of color. Far fewer black and Hispanic students, for example, graduate from high school on time: 51 and 52 percent respectively, as compared to the overall graduation rate of 71 percent.<sup>14</sup> Of those who graduate, one in five black students and one in six Hispanic students leave high school with the minimum qualifications to be considered for admission by the least-selective four-year colleges.<sup>15</sup>

Moreover, remediation rates for students of color are higher in comparison to rates for students overall and for white, non-Hispanic students. About four in ten of both black and Hispanic students required remediation, according to *Diploma to Nowhere*, as compared to 31 percent of white students and 34 percent of all students.<sup>16</sup>

In addition, students of color who graduate from high school are less likely to have completed rigorous college-preparatory curricula. According to a 2007 U.S. Department of Education report, six and eight percent, respectively, of black and Hispanic graduates completed rigorous curricula, as compared to 11 percent for white

students.<sup>17</sup> Not surprisingly, black and Hispanic students, as well as students from low-income families of all races and ethnic groups, are less likely to attend high schools that offer rigorous college-preparatory courses.<sup>18</sup>

This disproportionate impact on students of color naturally affects their share of the nation's overall college-bound and -qualified population, as one study found:

Because of the disparities in graduation and college-readiness rates among racial groups, black and Hispanic students are seriously underrepresented in the pool of minimally qualified college applicants. Only nine percent of all college-ready graduates are black and another nine percent are Hispanic, compared to a total population of 18-year-olds that is 14 percent black and 17 percent Hispanic.<sup>19</sup>

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## **COLLEGE READINESS:** Why It's Important

The failure of high schools to prepare students for college-level coursework has broad societal and economic implications, as well as serious lifelong consequences for individuals and families. For schools, taxpayers, and others, the costs are significant as well.

### **Importance for the Country**

The United States dominated the world economy for most of the 20th century, in large measure because the nation educated more of its young people to higher levels than any other developed country. However, by the 1970s, other countries began to gain ground. In 1960, the U.S.'s high school graduation rate for all workers led the industrialized world; by the 1990s, it had fallen to thirteenth. In one decade, from 1995 to 2005, the U.S. dropped from second to fifteenth among industrialized nations in its percentage of college graduates among college-age adults.<sup>20</sup>

Our nation's continued prosperity depends on reversing these trends. That can only happen, however, when the nation does a better job of producing high school graduates who are ready for college and work. The challenge the nation faces is made all the more difficult by demographic shifts. "Most of the increase in the traditional college-age population will be students of color and students from low-income homes," according to the Lumina Foundation. "All of these students ... will be needed in the workforce as the baby boom generation approaches retirement age."<sup>21</sup>

Perhaps one measure of a society's commitment to equal opportunity is the percentage of its citizens who receive the academic preparation necessary to attend and succeed in college, whether they pursue that route or not.

equal opportunity

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Students who are not college-ready will **earn less over their lifetime.**

In addition, students who take more rigorous courses than the core curriculum show greater persistence and are **more likely to graduate...**

## Consequences of Not Being Ready for College

For individuals, the ramifications of not being ready for college are daunting. The impact on others, including schools and taxpayers, is serious as well.

**MATTER OF NECESSITY.** Students who leave high school unready for college are more likely to face unemployment. In today's economy, a college degree is increasingly becoming a basic requirement. "An estimated 85 percent of current jobs and almost 90 percent of the fastest-growing and best-paying jobs now require some postsecondary education," according to the Business-Higher Education Forum and U.S. Department of Labor.<sup>22</sup> And, as was noted at the beginning of this paper, there is evidence for a correlation between college and workplace readiness.

**LIFETIME EARNINGS.** Students who are not college-ready will earn less over their lifetime. "In 2005, the typical full-time worker in the U.S. with a bachelor's degree earned \$50,900, 62 percent more than the \$31,500 earned by the typical full-time worker with only a high school diploma," the College Board estimates. Over a lifetime, college graduates typically earn over 60 percent more than high school graduates—that adds up to an earnings advantage of \$800,000.<sup>23</sup>

**CHOICE OF COLLEGE.** Students who complete rigorous college-preparatory courses are more likely to attend selective schools than students who do not—by a margin of as much as two to one.<sup>24</sup>

**PERSISTENCE.** Students who complete a core curriculum in high school are eight percent more likely to stay in college and attain a bachelor's degree than those who do not.<sup>25</sup>

In addition, students who take *more rigorous* courses than the core curriculum show greater persistence and are more likely to graduate, a U.S. Department of Education study found. About eight in ten students who had taken a rigorous curriculum in high school "were continuously enrolled in their initial institution," as compared to two-thirds of all students overall and about half of those who completed a core curriculum or lower.<sup>26</sup> Eighty-seven percent of students who completed rigorous curriculum earned a bachelor's degree, while just 62 percent of students who had a basic curriculum graduated.<sup>27</sup>

**COLLEGE SUCCESS.** Students who are ready for college get better grades. According to a 2008 ACT study, students who take a core curriculum in high school are seven to nine percent more likely to achieve a first-year college GPA of 2.0 or higher than students who do not. Students who take higher-level courses in high school are as much as 27 percent more likely to have a first-year GPA of 2.0 than students who do not.<sup>28</sup>

**COST OF COLLEGE.** Students who take remedial courses in college take more time to complete their degrees, adding to their total college costs.<sup>29</sup> Students who are not

college-ready also have more difficulty passing introductory courses. “At many community colleges, it takes students about two and a half tries to pass introductory math courses,” according to Carol A. Twigg of the National Center for Academic Transformation (NCAT).<sup>30</sup>

**COST OF REMEDIATION.** Colleges, universities, and governments spend billions of dollars annually on remedial courses. One study estimated that remedial courses at community colleges alone cost the nation \$1.4 billion annually.<sup>31</sup> More recently, Strong American Schools estimated total costs for remediation to be in the range of \$2.31 billion to \$2.89 billion.<sup>32</sup>

Research by Twigg of NCAT helps illustrate how schools *could* reduce the cost of remediation: institutions that redesigned the way *introductory* courses were taught reduced course rates for drops, failures, and withdrawals. In one study, the redesign of the way an introductory government class was taught at one college yielded close to \$70,000 in savings as a result of increased retention.<sup>33</sup>

**COSTS TO INSTITUTIONS.** College readiness has financial implications for institutions beyond the cost of remediation. Attrition, and in particular those students who drop out because they aren’t ready for college, affects institutional bottom lines. These costs, which don’t appear to have been well studied, are “rather complex and manifested in a variety of ways,”<sup>34</sup> and include the following:

- **Loss of tuition.** Postsecondary institutions that have flexible enrollment targets (that is, they attempt to serve as many students as possible) experience a loss of tuition income, as well as income generated by ancillary campus activities. These include bookstores, cafeterias, fees, and other income-producing activities. Colleges that limit the number of seats may experience a loss of income for the year or semester in which a student drops out.<sup>35</sup>
- **Loss of sunk costs.** “Every student a college enrolls costs it money to do so—big money, too,” one expert commented.<sup>36</sup> So, when a student drops out, a college is unable to recoup the money spent on recruiting and enrolling this student. A study of 40 colleges, universities, and career schools estimated that the average cost of enrolling a student was \$5,460.<sup>37</sup>

Research by Carol Twigg of NCAT suggests ways that colleges could mitigate the number of dropouts by students who may have left high school unprepared for college-level work. In one study, she found that by redesigning the way introductory courses are taught, 30 institutions improved student success rates and thereby reduced overall first-year attrition; they also reduced instructional costs by 37 percent on average—or an average savings of \$3.1 million in operating expenses per institution.<sup>38</sup>

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## Math’s Key Role in College Readiness

Mathematics plays an especially important role in achieving college readiness. “Algebra is a demonstrable gateway to later achievement,” the National Mathematics Advisory Panel wrote earlier this year.<sup>39</sup>

## Algebra’s Integral Role

Proficiency in Algebra is more than about getting into college, the Panel pointed out—it’s a prerequisite to mastering higher-level math in high school.<sup>40</sup>

Moreover, its relationship to college readiness can hardly be overstated. “Students who complete Algebra II are more than twice as likely to graduate from college compared to students with less mathematical preparation,” the Panel reported.<sup>41</sup> Similarly, another study found that high school students who take higher-level math courses are more likely to achieve a higher cumulative college GPA, stay in school at the same institution, and complete a bachelor’s degree than those who do not.<sup>42</sup>

Realization of Algebra’s importance has brought increased attention to pre-Algebra performance and instruction. Indeed, math taught from preschool through middle school “provides the basic foundation” for both Algebra and more high-level math courses, the Panel noted.<sup>43</sup> Perhaps of greater concern is what’s happening in middle school. “The sharp falloff in mathematics achievement in the U.S. begins as students reach late middle school,” just before or when Algebra instruction begins.<sup>44</sup> These developments led the Panel to lay out in some detail the concepts and skills that should be taught in elementary and middle school. In fact, the Panel called them “the most essential mathematics for students to learn thoroughly prior to Algebra.”<sup>45</sup>

African-American and Hispanic students who complete Algebra II benefit as well: “The differences in college graduation rates versus the student population in general are half as large as the differences for students who do not complete Algebra II,” the Panel found.<sup>46</sup>

## Benefits of Coursework Beyond Algebra II

According to Clifford Adelman, higher-level math is a “key marker in precollegiate momentum, with the tipping point of momentum toward a bachelor’s degree now firmly above Algebra II.”<sup>47</sup> Students who completed math coursework beyond Algebra II “were almost twice as likely to enroll in a four-year college as those who stopped at Algebra II” (64 percent compared with 34 percent), the American Council of Education recently reported.<sup>48</sup>

# Algebra’s importance

The benefits of taking higher-level math are especially great for minority students. Black students who completed a rigorous curriculum that included a mathematics course beyond Algebra II could increase their bachelor's degree attainment rate from 45 to 73 percent, Adelman estimated. Hispanic students could improve their chances from 61 to 79 percent.<sup>49</sup>

## Conclusion — Closing the College Readiness Gap

The broader implications of not being ready for college and the workplace are unmistakable. People who fail to graduate from high school or graduate without completing rigorous college-preparatory courses, especially in mathematics, are more likely to fail in college and the work world and more likely to experience lower life-time earnings and potential.

Whether students' aspirations are to pursue professional or career education, no matter what their end employment goals, the level of their math skills will play a significant role in their level of attainment. To succeed in this global economy in which computers and technology are pervasive, from the auto mechanics' diagnostic tune-up to the administration of diagnostic medical devices, workers without the knowledge and skills to use current and future technologies will experience limitations on their earnings potential and will be unprepared for further economic change.<sup>50</sup> The math-dependent employment fields of science and engineering, by far the fastest growing economic sectors, are producing new jobs, from post-high school positions requiring technician training to doctorate-level professions, at a rate three times faster than the economy overall.<sup>51</sup> Young men and women whose math skills are lagging will have limited employment opportunities in this robust job market. The prospect of losing these positions to offshore employers with a higher achieving workforce has dire implications for economic development in the United States.

Solutions do exist. Rigorous elementary and middle school preparation in math as well as other subjects, especially language arts and writing, are recognized as essential so that students arrive at high school prepared for college preparatory courses. Behavioral approaches such as active and ongoing counseling of students, particularly at critical transitions like entry into high school, can make a difference. Furthermore, smaller, theme-based school communities along with rigorous coursework can contribute to success in high school and readiness for college courses.

In recent years researchers from across the spectrum have increasingly viewed teaching quality as crucial to student achievement. "The research is clear: teachers matter," according to an exhaustive policy analysis conducted by the California Department of Education.<sup>52</sup>

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## PROFESSIONAL DEVELOPMENT

can contribute to teaching quality and hence college readiness by providing teachers a solid foundation of knowledge and practices that support successful learning in the classroom.

According to Professor Linda Darling-Hammond of Stanford University, “a growing body of research suggests that schools can make a difference [in student learning], and a substantial portion of that difference is attributable to teachers.”<sup>53</sup> The National Mathematics Advisory Panel recently reported “large, measurable differences in the effectiveness of mathematics teachers in generating achievement gains.”<sup>54</sup>

Professional development can contribute to teaching quality and hence college readiness by providing teachers a solid foundation of knowledge and practices that support successful learning in the classroom. Recent state-based and national educational reforms have added emphasis to making teacher preparation and teaching quality a priority. For example, many national and state-based initiatives implementing more rigorous college-preparatory curriculum require teachers to possess significantly more subject-matter knowledge. According to research cited by the Alliance for Excellent Education, “teachers with strong content knowledge make a greater impact on student learning.”<sup>55</sup> Teachers also must possess both knowledge of instructional practice, or pedagogy, and knowledge of content for its use in the classroom, many researchers believe.

**Other promising solutions that have shown progress in recent years have focused on personalization to engage students in active learning and to enhance and inform assessment. Computer- and Internet-based instructional materials that actively engage students in learning and provide immediate feedback and tutorial assistance can have demonstrable and positive effects on achievement, since students are motivated to do more work, thus retaining more knowledge and improving their scores.**

**Technology-based programs can help institutions meet the growing demand for remedial math courses, while helping to reduce the cost of math instruction in higher education through reduced failures and withdrawals, increased success rates and higher success in later courses.**

Self-paced learning liberates teachers and students alike. Technology-based programs that offer a wide range of homework, tutorial and assessment tools can make it easier for teachers to manage their courses and meet the learning needs of multiple levels of learners, as well as monitor progress against standards. Students are appropriately challenged—they’re set up for success, not frustration, failure, or boredom.

Whether the use of technology, enhancing teacher preparation and ongoing training, active intervention at critical stages, or other proven approaches, as a nation we must do more to prepare students for success in college and the workplace. It will have benefits for human potential and the pursuit of happiness and for efficient resource allocation in our nation and world.

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- <sup>1</sup> Paul Barton, *One-Third of a Nation: Rising Dropout Rates and Declining Opportunities* (Educational Testing Service, 2005), pp. 3, 9. Barton notes that several different researchers between 1998 and 2000 produced estimates of the national graduation rate ranging from 66 percent to 71 percent.
- <sup>2</sup> Jay P. Greene and Greg Forster, *Public High School Graduation and College Readiness Rates in the United States* (Manhattan Institute for Policy Research, 2003), pp. 1, 8.
- <sup>3</sup> *Rigor at Risk: Reaffirming Quality in the High School Core Curriculum* (ACT, Inc., 2007), p. 1. Students were considered college-ready if their ACT scores indicated a 50 percent chance of scoring a B or better or 70 percent likelihood of scoring a C or better grade in introductory college courses.
- <sup>4</sup> *Diploma to Nowhere* (Strong American Schools, September 2008), pp. 8–9.
- <sup>5</sup> *Coming of Age in the 1990s: The Eighth-Grade Class of 1988 12 Years Later* (National Center for Education Statistics, U.S. Department of Education, 2002), as cited by *Diploma to Nowhere*, p. 9 (“Of all the students who started eighth-grade middle school in 1988, only 29 percent eventually received a college degree some 12 years later”).
- <sup>6</sup> *Ibid.*
- <sup>7</sup> Lutz Berkner, Susan Choy, and Tracy Hunt-White, *Descriptive Summary of 2003–04 Beginning Postsecondary Students: Three Years Later* (National Center for Education Statistics, U.S. Department of Education, July 2008), p. 76. See also *The Condition of Education 2004 in Brief* (National Center for Education Statistics, U.S. Department of Education, 2004), p. 17 (28 percent of college freshmen took remedial courses).
- <sup>8</sup> *Diploma to Nowhere*, p. 10.
- <sup>9</sup> *Ibid.* pp. 21–22, 24–25.
- <sup>10</sup> *Ibid.* p. 9.
- <sup>11</sup> *Ibid.*
- <sup>12</sup> *Steps Can Be Taken to Reduce Remediation Rates* (Office of Program Policy Analysis & Government Accountability, State of Florida Legislature, 2006), p. 1.
- <sup>13</sup> *Diploma to Nowhere*, pp. 10 and 24.
- <sup>14</sup> Greene and Forster, p. 1.
- <sup>15</sup> *Ibid.*
- <sup>16</sup> *Diploma to Nowhere*, p. 12.
- <sup>17</sup> *The Nation’s Report Card: America’s High School Graduates* (National Center for Education Statistics, U.S. Department of Education, 2007), p. 13. The gap between black and white students in one area did close entirely: by 2005, 52 percent of black students and 51 percent of white students had completed at least a mid-level high school curriculum. Although Hispanic students increased their completion rate from 23 percent in 1990 to 44 percent in 2005, a 7 percentage point white–Hispanic gap remained (p. 27).
- <sup>18</sup> Clifford Adelman, “The Toolbox Revisited: Paths to Degree Completion from High School through College” (U.S. Department of Education, 2006), p. 19.
- <sup>19</sup> Greene and Forster, p. 1.
- <sup>20</sup> Andreas Schleicher, *Science competencies for tomorrow’s world* (OECD Directorate for Education, February 2008), slides 4, 5.
- <sup>21</sup> [http://luminafoundation.org/research/what\\_we\\_know/index.html](http://luminafoundation.org/research/what_we_know/index.html)
- <sup>22</sup> *High School Teaching for the Twenty-First Century: Preparing Students for College* (Alliance for Excellent Education, 2007), p. 1.
- <sup>23</sup> *Education Pays 2007* (College Board, 2007), pp. 9–10.
- <sup>24</sup> Laura Horn, Lawrence K. Kojaku, and C. Dennis Carroll, *High School Academic Curriculum and the Persistence Path through College* (National Center for Education Statistics, U.S. Department of Education, 2001), p. iv.
- <sup>25</sup> *What We Know about College Success: Using ACT Data to Inform Educational Issues* (ACT, Inc., 2008), p. 5.
- <sup>26</sup> Horn, Kojaku, and Carroll, pp. iv–v.
- <sup>27</sup> *Ibid.*
- <sup>28</sup> *What We Know about College Success: Using ACT Data to Inform Educational Issues* (ACT, Inc., 2008), p. 3.
- <sup>29</sup> *Diploma to Nowhere*, p. 11; Clifford Adelman, *Answers in the Tool Box: Academic Intensity, Attendance Patterns, and Bachelor’s Degree Attainment* (U.S. Department of Education, 1999), Appendix D.

- <sup>30</sup> Carol A. Twigg, *Increasing Success for Underserved Students: Redesigning Introductory Courses* (National Center for Academic Transformation, 2005), p. 14.
- <sup>31</sup> Alliance for Excellent Education 2006, NCES 2004.
- <sup>32</sup> *Diploma to Nowhere*, p. 11.
- <sup>33</sup> Carol A. Twigg (National Center for Academic Transformation, 2003) retrieved on July 2, 2008, from [http://www.thencat.org/PCR/R1/UCF/UCF\\_FR2.htm](http://www.thencat.org/PCR/R1/UCF/UCF_FR2.htm).
- <sup>34</sup> *Retention 101 – The Cost of Student Attrition*, retrieved June 29, 2008, from [http://www.studentretention.org/rtn101\\_attrition.html](http://www.studentretention.org/rtn101_attrition.html).
- <sup>35</sup> Ibid.
- <sup>36</sup> Neal Raisman, Ph.D., retrieved June 29, 2008, from <http://academicmaps.blogspot.com/2007/07/cfs2-customer-service-saves-even-more.html>.
- <sup>37</sup> Ibid. The costs included in the study related to marketing, advertising, publications, admissions, travel, orientation, bursar, registrar, academic counseling and financial aid activities, mailings, phone calls, web site, and so on.
- <sup>38</sup> Carol A. Twigg, *Increasing Success for Underserved Students*, p. 2.
- <sup>39</sup> *Final Report of the National Mathematics Advisory Panel* (U.S. Department of Education, 2008), p. xiii.
- <sup>40</sup> Ibid.
- <sup>41</sup> Ibid.
- <sup>42</sup> “What We Know about College Success,” p. 5.
- <sup>43</sup> Ibid. p. 25.
- <sup>44</sup> Ibid. p. xiii.
- <sup>45</sup> Ibid. p. 17.
- <sup>46</sup> *Final Report*, p. xiii.
- <sup>47</sup> Adelman, p. 20. Adelman added, “[I]n order for that momentum to pay off, earning credits in truly college-level mathematics on the postsecondary side is *de rigeur*. . . . By the end of the second calendar year of enrollment, the gap in credit generation in college-level mathematics between those who eventually earned bachelor’s degrees and those who didn’t is 71 to 38 percent (table 21).”
- <sup>48</sup> Susan P. Choy, *Access & Persistence: Findings from 10 Years of Longitudinal Research on Students* (American Council of Education, 2002), p. 15.
- <sup>49</sup> Adelman 2006, p. 36.
- <sup>50</sup> Schoenfeld, Alan H. (2002). “Making Mathematics Work for All Children: Issues of Standards, Testing, and Equity.” *Education Researcher*, Vol. 31, No. 1, pp. 13–25. [www.noycefdn.org/documents/Making\\_Math\\_Work\\_Schoenfeld.pdf](http://www.noycefdn.org/documents/Making_Math_Work_Schoenfeld.pdf)
- <sup>51</sup> National Mathematics Advisory Panel (2008). *Foundations for Success: The Final Report of the National Mathematics Advisory Panel*, U.S. Department of Education: Washington, DC. [www.ed.gov/about/bdscomm/list/mathpanel/report/final-report.pdf](http://www.ed.gov/about/bdscomm/list/mathpanel/report/final-report.pdf)
- <sup>52</sup> Julia E. Koppich, *Reshaping Teacher Policies to Improve Student Achievement*, (Policy Analysis for California Education, 2008), p. 1. (“High-quality teachers are the most important contributor to improving student learning.”)
- <sup>53</sup> Linda Darling-Hammond, *Teacher Quality and Student Achievement: A Review of State Policy Evidence* (Education Policy Analysis Archives, 2000), as retrieved on August 4, 2008 at <http://epaa.asu.edu/epaa/v8n1/>.
- <sup>54</sup> *Final Report*, p. 35 (“Differences in teachers account for 12% to 14% of total variability in students’ mathematics achievement gains during an elementary school year.”)
- <sup>55</sup> *High School Teaching for the Twenty-First Century*, p. 5 (citing studies on math and science instruction).