RESEARCH FOUNDATIONS:

Empirical Foundations for College and Career Readiness

CollegeBoard

Foreword:

Research Foundations represents the work of numerous colleagues both at the College Board and in the broader field of education research. We wish to extend our thanks to those whose work constitutes, informs, and inspired *Research Foundations,* as well as those who contributed generously of their time and expertise during the creation of this document.

Research Foundations: Empirical Foundations for College and Career Readiness

Introduction

In 2014, only 43% of high school graduates who took the SAT® met the SAT College Readiness Benchmarks, indicating that they are prepared to enter a four-year postsecondary institution and have a high likelihood of success in first-year college courses. This means that the majority of SAT takers who enter college are not prepared to succeed in first-year courses. Unprepared students are more likely to need remediation in one or more subject matter areas.

The College Board is committed to preparing all students in our care for college and career success by the time they graduate from high school. As such, we designed the College Board College and Career Readiness System, which engages students, teachers, K–12 administrators, higher education institutions, and policymakers around this goal, beginning in middle schools and continuing through the early years of college. This system is driven by College Board research that identifies the factors that matter most in college and career readiness. The findings in this document serve as the foundational research principles upon which the College Board's system has been founded. We will continue to research what matters in college and career readiness and success to further inform and refine our system so that we can better serve students in their postsecondary education pursuits.

FOUNDATIONAL PRINCIPLE

1

Students who are ready for a college education are more likely to succeed and persist to completion.

- Student progress toward college and career readiness must begin early. College readiness is defined as being prepared for any type of postsecondary education, including two-year and four-year institutions and trade and technical schools offering workforce training programs.
- Research shows that the SAT and PSAT/NMSQT® are strong indicators of college readiness and are highly related to success in college.
- Students who meet the SAT College and Career Readiness Benchmarks are more likely to succeed in college.

Higher SAT scores are a strong indicator of college success: There is a positive relationship between SAT scores and GPA in each year of college. Students who perform well on the SAT are also more likely to persist to a second year and graduate in a timely manner.

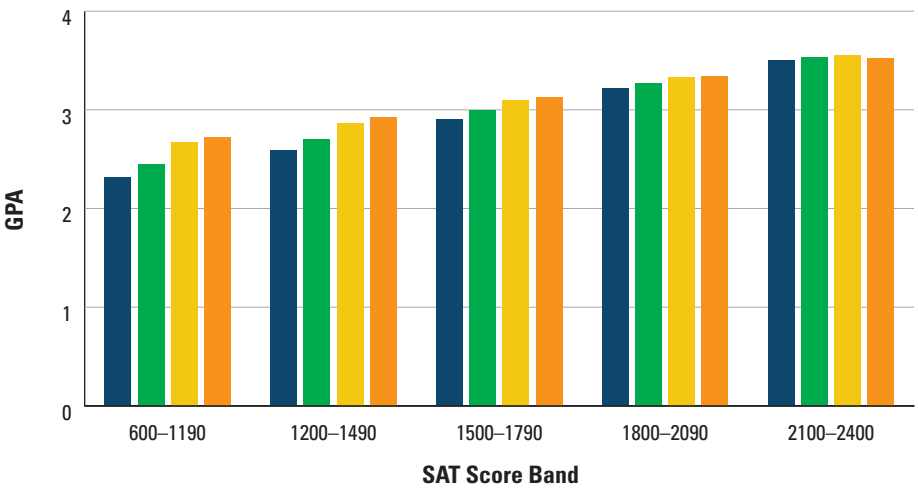


FIGURE 1A

GPA by SAT Score Band

The SAT is a strong indicator of postsecondary achievement. The higher a student scores on the SAT, the more likely he or she is to have a higher GPA in each year of college.

- First-Year GPA
- Second-Year GPA
- Third-Year GPA
- Fourth-Year GPA

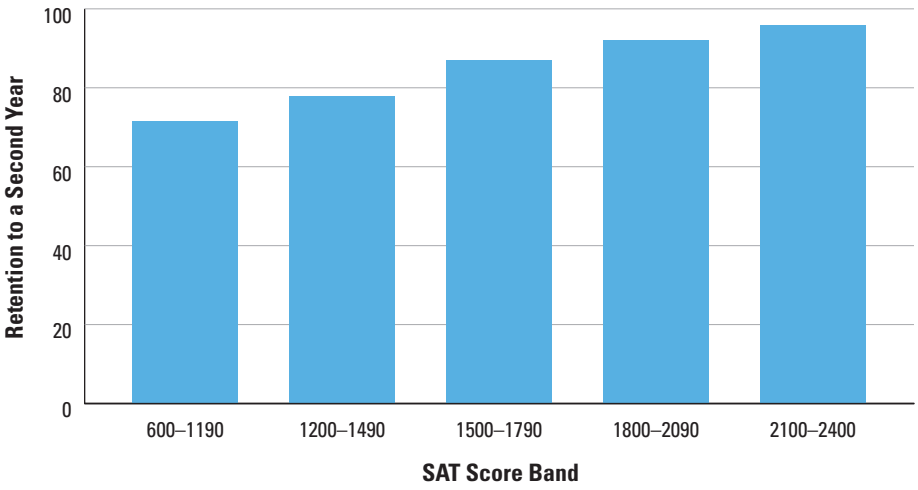


FIGURE 1B

Postsecondary Retention by SAT Score Band

The SAT is also a strong indicator of persistence. The higher a student scores on the SAT, the more likely he or she is to persist to a second year of college.

- Percentage of Students Retained to the Second Year

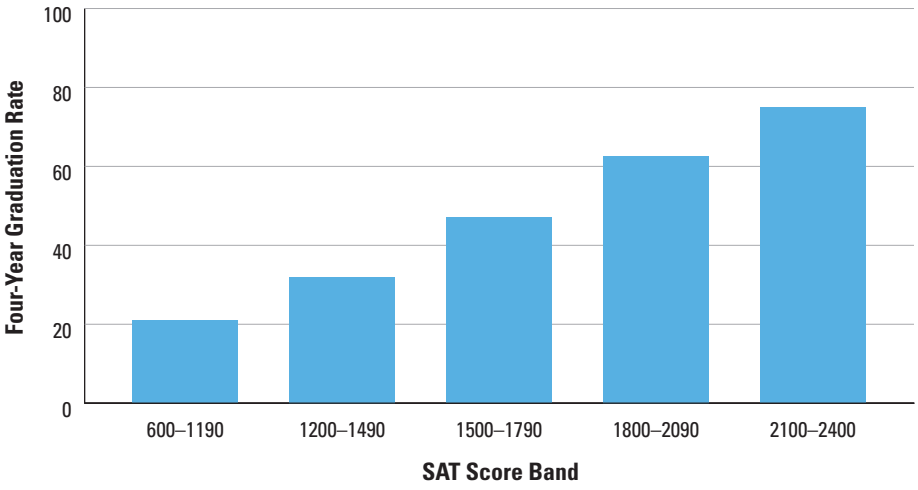


FIGURE 1C

Four-Year Graduation Rates by SAT Score Band

Similar to the SAT relationship with persistence to the second year of college, the higher a student scores on the SAT, the more likely he or she is to graduate in four years or less.

- Percentage of Students

FOUNDATIONAL PRINCIPLE

2

It is important for students to engage in the college-preparation process early and regularly monitor whether they are on target for college and career readiness through high school graduation.

- Monitoring students' progress allows teachers, counselors, and administrators to identify students who are not on target and implement academic interventions to get them on target.
- Students who engage in the process early, demonstrate being on target, and who continue to monitor their progress and demonstrate being on target tend to have higher rates of postsecondary success than students who do not persist — this applies to students of all races and ethnicities.

The College Board College and Career Readiness System is a way for students to engage earlier and more intensively in the college-preparation process. The assessments in the College Board System allow students to demonstrate their knowledge, skills, and abilities as they relate to college and career readiness and monitor whether they are on target to succeed.

THE BENEFITS OF ENGAGING EARLY: Students who begin to monitor whether they are on target for college and career readiness earlier in high school, and who demonstrate being on target for success, have more positive college outcomes in terms of enrollment in a four-year college, retention, and graduation. Figure 2A illustrates the advantages of engaging in the process early for those students who demonstrate being on target for college success. Students who participate in, and meet or exceed the benchmark on only the SAT, have lower rates of postsecondary success than students who participate in the 11th-grade PSAT/NMSQT and the SAT, and meet or exceed the benchmark on both assessments. Students who meet or exceed the benchmark on all three assessments have the highest rates of postsecondary outcomes.

THE BENEFITS OF ENGAGING CONSISTENTLY: Figure 2B presents the results of research examining continuous monitoring and success beginning with the 10th-grade PSAT/NMSQT, continuing with the 11th-grade PSAT/NMSQT, and through to the SAT. Students who engage in the system early in 10th grade and continue to monitor their progress through the 11th-grade PSAT/NMSQT and the SAT and demonstrate college and career readiness throughout have the highest rates of postsecondary success.

CAVEAT: It is important to note that prior student achievement has not been considered in these analyses, and school or district characteristics were not controlled. The students observed may have been higher performing prior to engaging in the system. School or district effects may also be relevant to those students' postsecondary outcomes.

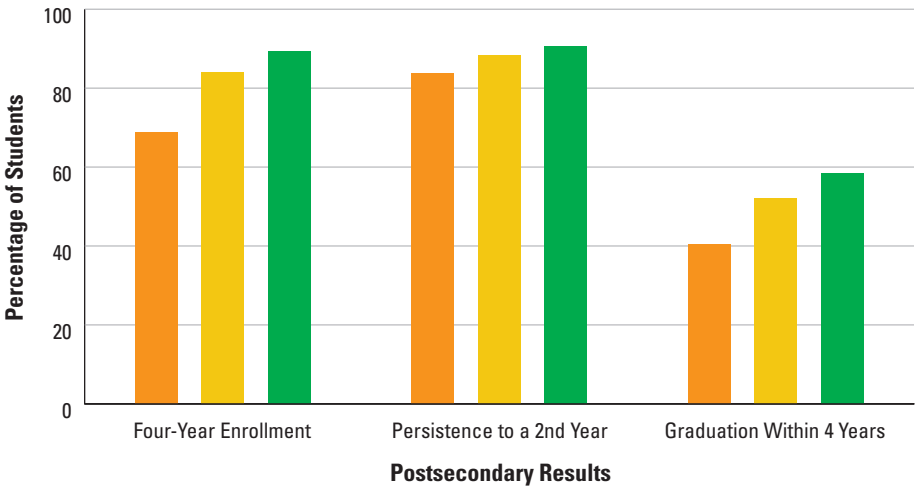


FIGURE 2A

Results of Beginning the College and Career-Ready Suite of Assessments Early for Students Who Demonstrate Readiness

Students demonstrating earlier engagement and success are more likely to enroll, persist, and graduate within four years.

- SAT Only
- PN11 and SAT
- PN10, PN11, and SAT

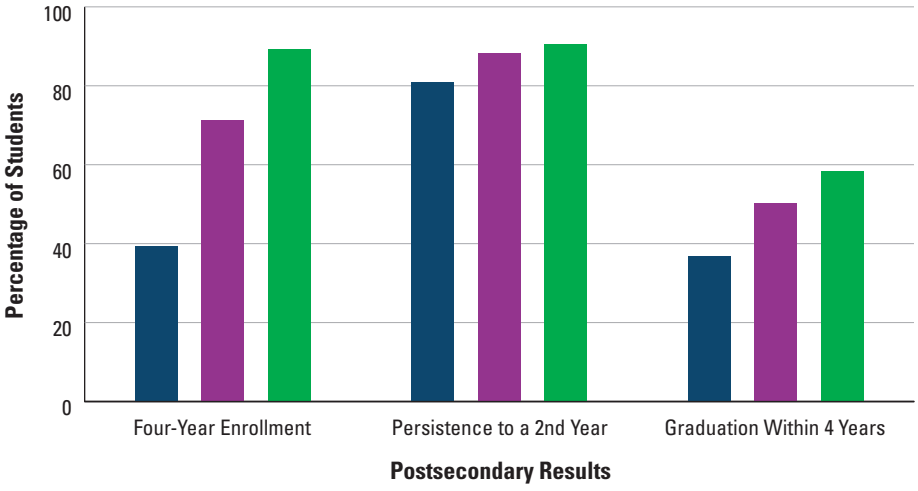


FIGURE 2B

Results of Persisting on the College and Career-Ready Suite of Assessments for Students Who Demonstrate Readiness

Students who persist on the College and Career-Ready Suite of Assessments longer, and demonstrate being on target, are more likely to enroll, persist, and graduate within four years.

- PN10 Only
- PN10 and PN11
- PN10, PN11, and SAT

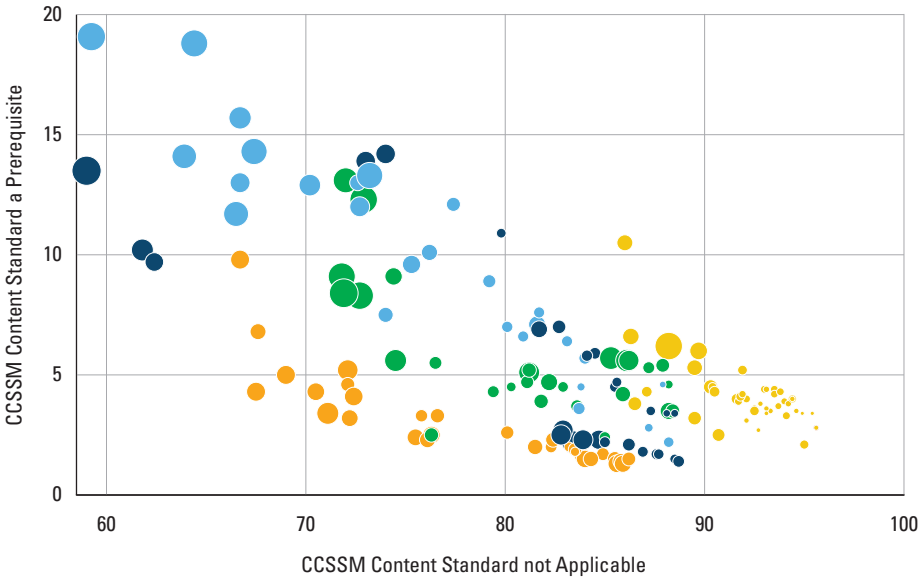
FOUNDATIONAL PRINCIPLE

3

Focusing in greater depth on fewer areas of knowledge that research shows are essential for readiness in postsecondary education is more likely to lead to college success.

- Focus and clarity in instruction, centered on the essentials in depth, increase achievement and prepare a large proportion of students for college and career success.
- Numerous studies have shown that it is beneficial for students to have in-depth knowledge of a few key topics, rather than superficial knowledge of many.
- Postsecondary educators have identified several subject areas as having particular relevance to postsecondary work, highlighting the importance of these subjects being emphasized in high school.
- For several of these topics, it is essential that this in-depth focus continue over the course of several school years, in order to reexamine certain aspects of a topic and fully gauge students' depth of understanding.

Students can truly benefit from gaining a deep understanding of the key concepts of a discipline. This approach requires that teachers themselves have in-depth knowledge of certain subject matter and that teachers articulate their efforts across grades in order to spread particularly complex topics across several years. Assessments must also be adjusted to reflect a new focus on deep understanding rather than shallow coverage of a broader number of topics.



The horizontal axis plots postsecondary (two- and four-year) instructor evaluation of the applicability of the CCSSM content standard to introductory college courses, ranging from most applicable (left) to least (right). The vertical axis plots the percentage of postsecondary instructors judging the importance of the CCSSM content standard as a prerequisite to introductory college courses. Bubbles are larger or smaller, according to importance.

FIGURE 3A

Postsecondary Survey: Differential Importance of Common Core State Standards in Math (CCSSM)

There are certain topics within disciplines that postsecondary instructors have identified as being essential to postsecondary education. Within the field of mathematics, for example, it is important for high school students to study algebra in depth, since it has been identified as being an essential part of postsecondary education.

- Number and Quantity
- Algebra
- Functions
- Geometry
- Statistics and Probability

	Grade							
Topic	1	2	3	4	5	6	7	8
Whole Number: Meaning								
Whole Number: Operations			●					
Measurement Units			●		●			
Common Fractions								
Equations & Formulas								
Data Representation and Analysis			●		●			
2-D Geometry: Basics								
2-D Geometry: Polygons & Circles								
Measurement: Perimeter, Area & Volume						●		
Rounding & Significant Figures								
Estimating Computations								
Whole Numbers: Properties of Operations								
Estimating Quantity & Size								
Decimal Fractions								
Relation of Common & Decimal Fractions								
Properties of Common & Decimal Fractions	○	○						
Percentages	○							
Proportionality Concepts								
Proportionality Problems								
2-D Geometry: Coordinate Geometry								
Geometry: Transformations								
Negative Numbers, Integers & Their Properties								
Number Theory								
Exponents, Roots & Radicals	○	○						
Exponents & Orders of Magnitude	○	○						
Measurement: Estimation & Errors								
Constructions Using Straightedge & Compass	○	○	○	○				
3-D Geometry								
Geometry: Congruence & Similarity								
Rational Numbers & Their Properties	○	○	○					
Patterns, Relations & Functions								
Proportionality: Slope & Trigonometry	○	○	○	○	○			

FIGURE 3B

Coherence of Curriculum in the United States Compared to that of the Highest-Achieving Countries

While a focus on in-depth learning is highly beneficial, it is important that this focus be articulated across grades. More than half of the highest-achieving countries enjoy a coherent progression of curricula; unfortunately, this trend is not common in the United States.

- ● Intended by all states
- ○ Intended by none of the states
- Intended by more than half of the top-achieving countries

FOUNDATIONAL PRINCIPLE

4

The progress of those students who have fallen behind in high school must be accelerated so they can get back on target to become college and career ready by graduation.

- Even upon graduating high school, many students need remediation when they get to college.
- When students come to school with inadequate levels of academic preparedness, achievement gaps continue to grow during the school year, unless students participate in remedial course work.
- Studies have shown that students who need remediation in college are less likely to graduate.
- If low-achieving students are identified earlier, they can receive supplementary instruction to accelerate their progress while still in high school.

Research shows that almost a third of students require some form of remediation when they reach college. Of those students in remediation, 40% end up taking at least one full year of remediation.

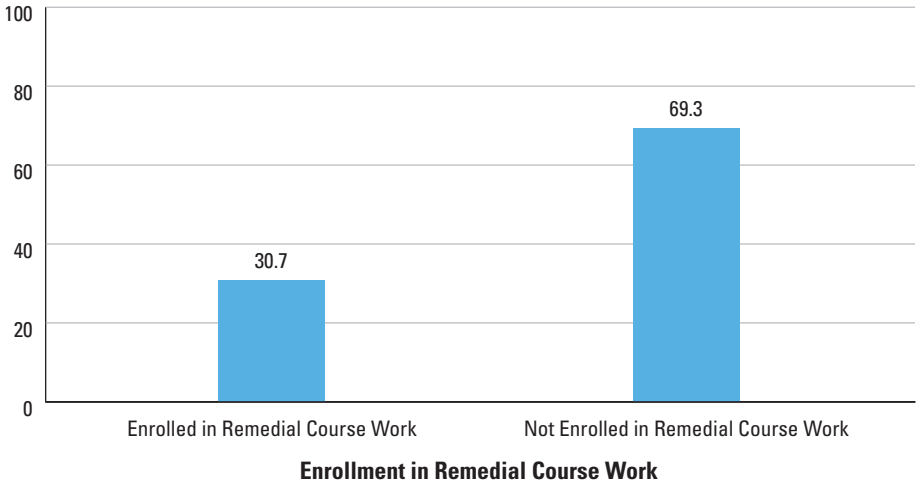


FIGURE 4A

Percentage of Student Population Enrolled in Remedial Course Work

Clearly, efforts must be made to accelerate student learning in high school, as almost a third of college students are enrolled in some form of remediation.

Percentage of Students

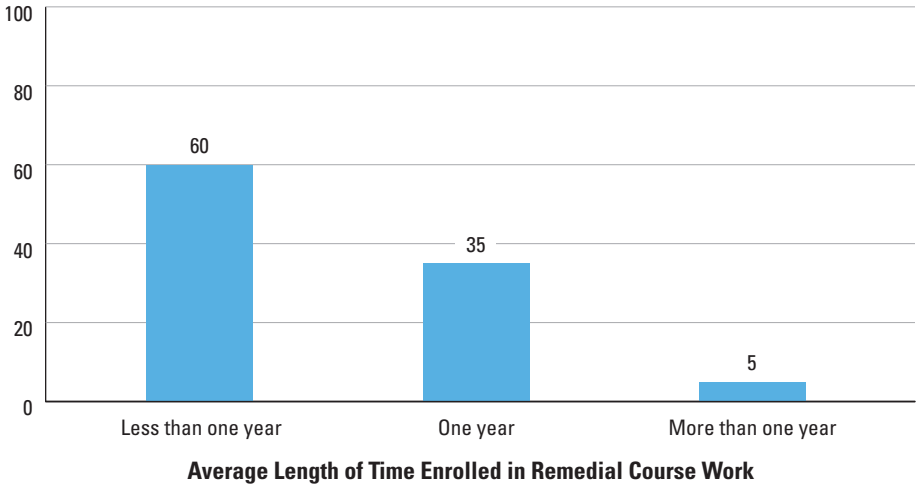


FIGURE 4B

Average Length of Time Enrolled in Remedial Course Work

If possible, steps must be taken to help students to regain lost ground while in high school. When students enroll in college remedial courses, 40% of them end up spending a year or more in remediation.

Percentage of Students

FOUNDATIONAL PRINCIPLE

5

Middle schools and high schools play an important role in creating a college-going culture for all students by encouraging them to make a tangible plan to pursue postsecondary education and by aiding students in following through on those plans.

- Students who aspire to postsecondary education must plan and take action to realize their aspirations.
- As many as 60% of students who aspire to postsecondary education do not ultimately enroll in a four-year postsecondary program.
- High schools play an important role in creating a college-going culture for students.
- Students in schools that are rated by teachers as having a strong college-going climate are more likely to act on their aspirations by planning to attend, applying to, and being accepted to a four-year college.
- Students who attend a high school where they receive active encouragement and aid in pursuing postsecondary education are more likely to follow through with their intention to do so.

Unfortunately, far too many students who aspire to enroll in postsecondary education do not make plans to apply to college or enroll. However, students who attend high schools that have created a college-going culture are more likely to be supported to pursue their plans, are more likely to pursue postsecondary education, and are also more likely to pursue it shortly after high school.

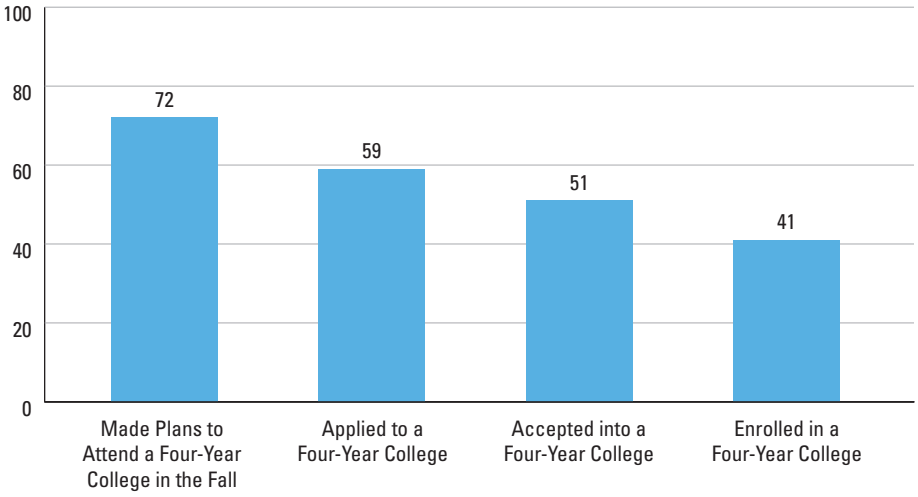


FIGURE 5A

Students Who Aspire to Complete a Four-Year Degree

Not all students who aspire to pursue postsecondary education enroll in a four-year college, with less than half of students enrolling by the fall following graduation. In fact, less than 60% of students who aspire to college actually apply to college, and a quarter of them do not even go so far as to create a viable plan for postsecondary education.

Percentage of Students

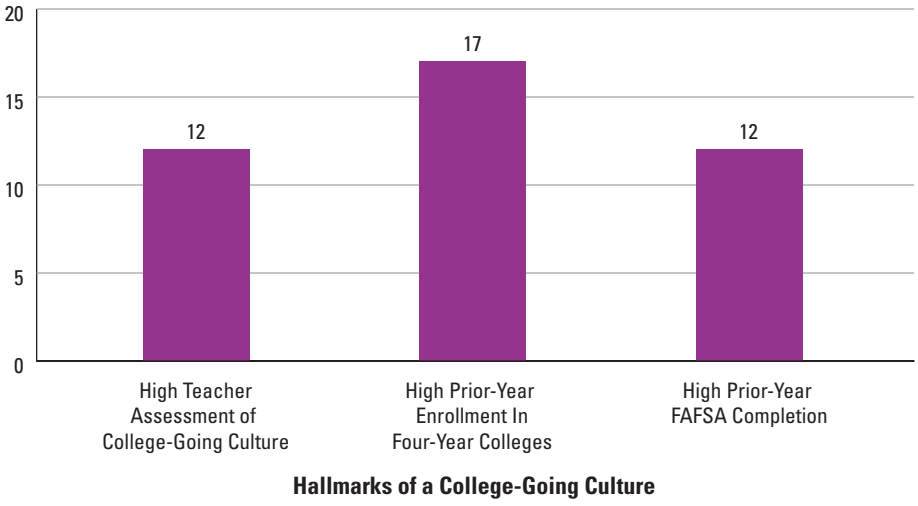


FIGURE 5B

Increased Likelihood of Taking Steps Toward Postsecondary Enrollment

Students who attend a high school with a strong college-going culture are more likely to take steps toward enrollment in postsecondary education. A strong college-going culture is one where teachers generally have a positive perception of the school's college-going climate and a high number of prior-year students have attended college and/or completed the Free Application for Federal Student Aid (FAFSA).

Percentage Point Improvement in Enrolling in an Academically Matched School

FOUNDATIONAL PRINCIPLE

6

Students who take more rigorous course work in high school are more likely to be ready for college and career by the time they graduate from high school than students who take less rigorous course work.

- Academic rigor is such an important factor in college and career success that the College Board has established a scale of academic rigor. The academic rigor index (ARI) was created by examining the relationship between high school course participation, as measured by student responses on the SAT Questionnaire, and first-year GPA (FYGPA). To date, the ARI has demonstrated a positive relationship between rigorous work in high school and high school GPA (HSGPA), SAT scores, college enrollment, FYGPA, and persistence to a second year of college.
- Students who have a more rigorous high school academic experience, as defined by the College Board's academic rigor index, are better prepared for the academic demands of a four-year college.
- Students who take more rigorous course work in high school are more likely to enroll in a four-year college and achieve higher grades in a four-year college.

The academic rigor of a student's course work in high school is related to high school and college success. Students with higher academic rigor scores are more likely to be college ready. Those students who participate in more rigorous course work are more likely to enroll in a four-year college, have higher first-year grades, and persist to a second year.

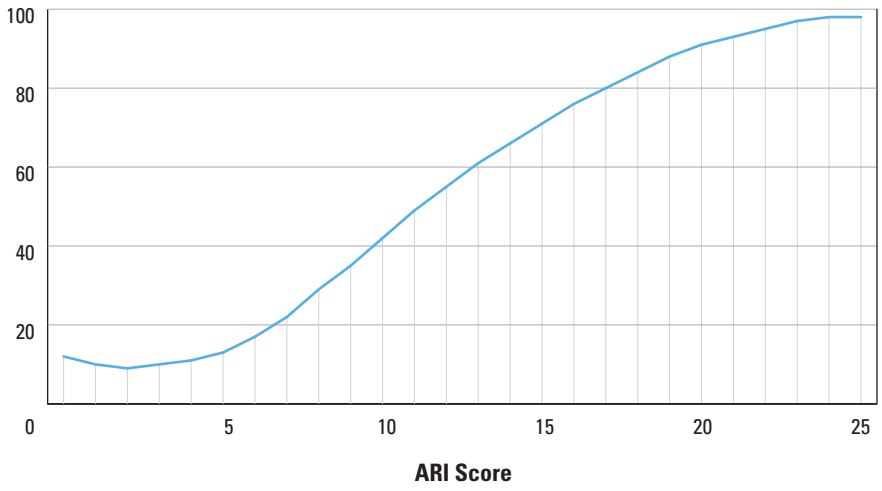


FIGURE 6A

ARI and College Readiness

Academic rigor, as defined by ARI, is a good measure of college readiness. As the quality and intensity of courses increase, students are more likely to meet the college readiness benchmark, a measure of students' postsecondary preparedness.

— Percentage of Students Meeting College Readiness Benchmark

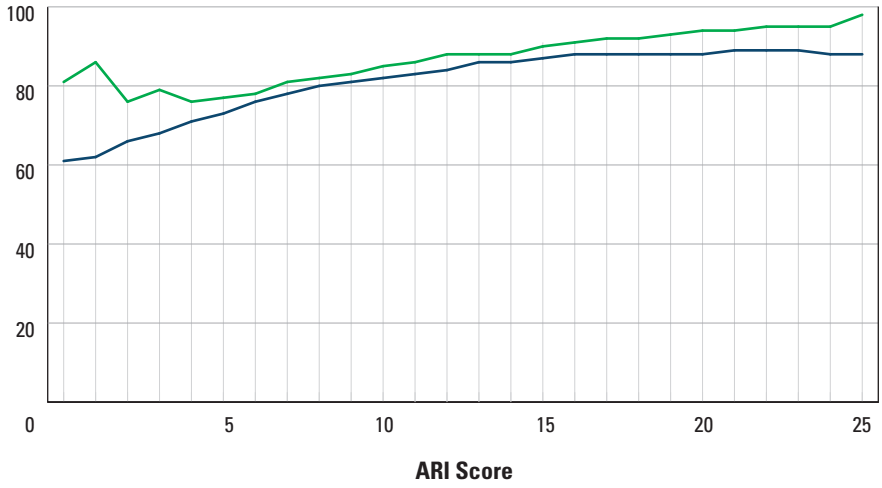


FIGURE 6B

ARI as an Indicator of Enrollment and Retention

Academic rigor is also a strong indicator of postsecondary success: As the number of rigorous courses students are exposed to rises, so too does enrollment in college and retention rates.

— Percentage of Students Enrolled in College

— Percentage of Students Persisting to a Second Year

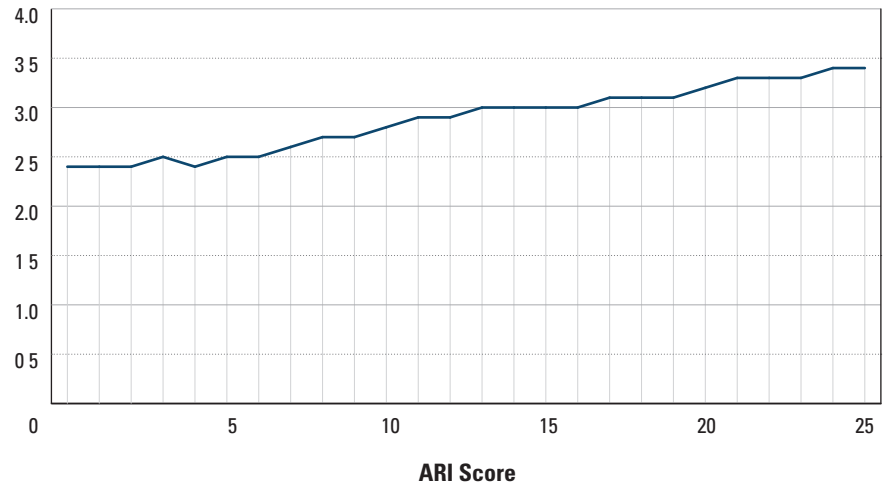


FIGURE 6C

ARI as an Indicator of First-Year GPA

Students who are exposed to more rigorous course work are also more likely to have higher first-year GPAs.

— First-Year College GPA

FOUNDATIONAL PRINCIPLE

7

Students who participate in rigorous college-level course work in high school, including Advanced Placement Program® (AP®) courses, are more likely to attain postsecondary success.

- Students who take AP® Exams in high school are more likely to enroll in college and graduate in four years or less.
- Students who earn higher scores on AP Exams have even higher timely graduation rates than students who earn lower AP scores.
- However, unequal access to rigorous course work is persistent and pervasive. In 2014, the College Board estimates that 286,403 students are not taking the matched AP courses for which they show potential.

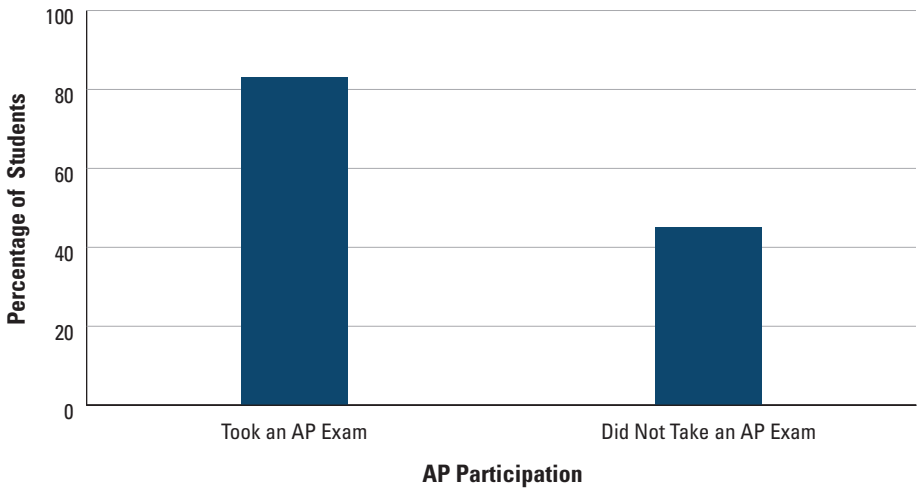


FIGURE 7A

AP Participation and Student Enrollment

Participation in rigorous high school course work is associated with greater college enrollment. Students who take an AP Exam are almost twice as likely to enroll in a four-year college as students who did not take an AP Exam.

Enrolled in a Four-Year Institution

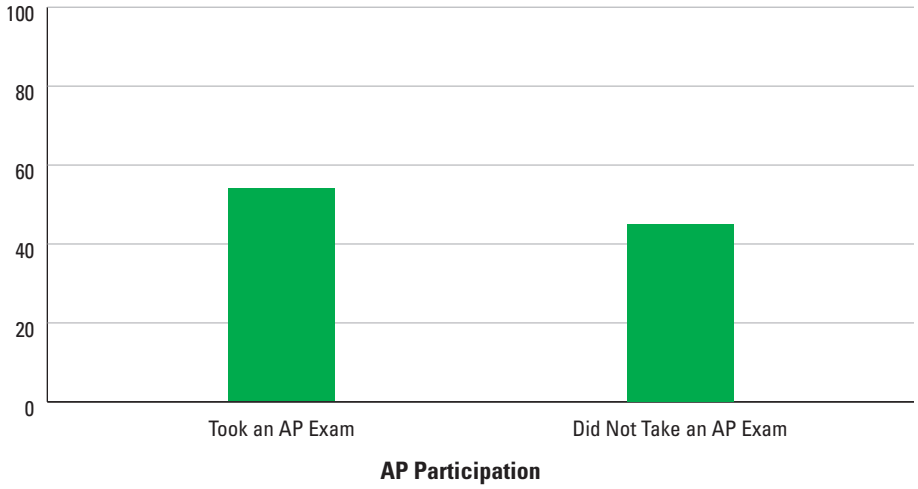


FIGURE 7B

Four-Year Graduation Rate Based on AP Participation

Participation in rigorous high school course work is associated with higher rates of four-year college graduation: Students who participate in AP are more likely to graduate in four years or less than students who do not take AP courses, irrespective of AP Exam scores.

Percentage of Students Graduating in Four Years or Less

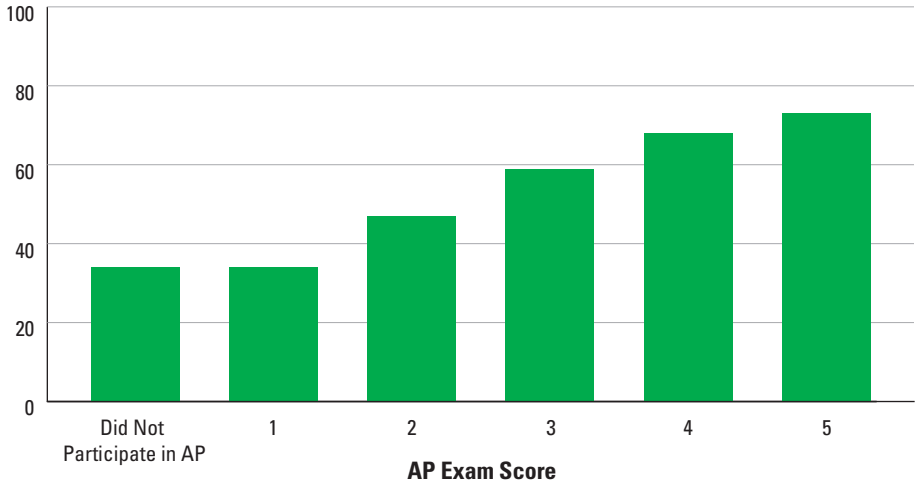


FIGURE 7C

Four-Year Graduation Rate Based on AP Exam Performance

Figure 7C shows the impact of rigorous high school course work on college graduation, as stronger performance in AP is associated with greater likelihood of graduating in four years or less.

Percentage of Students Graduating in Four Years or Less

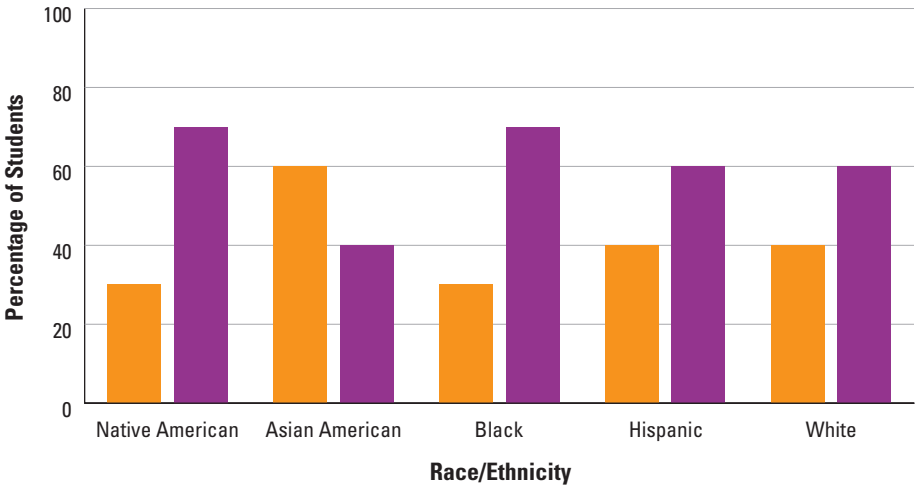


FIGURE 7D

Students with Potential Taking AP Science Exams

Despite the benefits, a large number of students do not seek to take rigorous AP course work, even though they possess the academic qualifications to do so. For example, among students with potential for success in AP science course work, only a fraction took any AP science exams. While this finding is true among all students, it is particularly true among underrepresented students.

Students with Potential Taking AP Science Exams

Students with Potential Not Taking AP Science Exams

FOUNDATIONAL PRINCIPLE

8

Improving college readiness can address the issue of inequality in education by increasing college graduation rates for all students, regardless of their ethnicity or household income levels.

- → Students face inequitable access to academic rigor in high school, especially underrepresented minority students and low-income students.
- → Providing access to rigor increases equity in education and better prepares students to succeed in college and career.

Studies have shown that low-income and minority students have a lower likelihood of college completion. Furthermore, those who do complete college have a reduced chance of finishing in four years, with only around a quarter graduating in four years in each group.

However, research has shown that increasing college readiness should improve time to completion, with practically double the number of college-ready students graduating on time versus those not considered to be college ready.

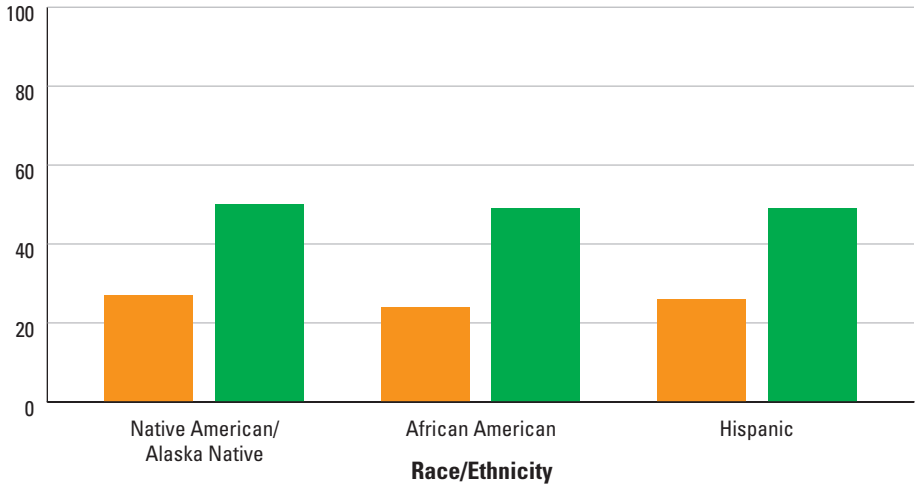


FIGURE 8A

Four-Year Graduation Rates by College Readiness and Race

College readiness is an important factor in achieving equity in education for underrepresented minority students, with four-year graduation rates nearly double those of their peers who were not college ready.

- Percentage Not College Ready Graduating in Four Years or Less
- Percentage College Ready Graduating in Four Years or Less

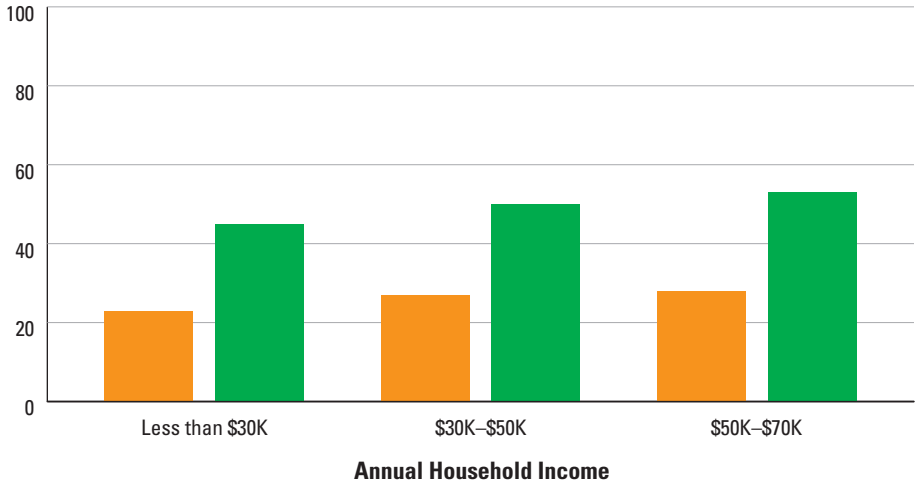


FIGURE 8B

Four-Year Graduation Rates by College Readiness and Income

College readiness is also an important factor in achieving equity in education for low-income students, with four-year graduation rates nearly double those of their peers who were not college ready.

- Percentage Not College Ready Graduating in Four Years or Less
- Percentage College Ready Graduating in Four Years or Less

FOUNDATIONAL PRINCIPLE

9

When students are accurately placed into college courses, they are more likely to succeed in those courses and persist to a degree.

- Students who are accurately placed into college courses that are appropriately matched to their achievement levels are likely to succeed in those courses.
- Students who are inaccurately placed in remedial course work may extend time to graduation and incur additional costs.
- College readiness tools such as ACCUPLACER® can help increase the accuracy of course placement decisions.

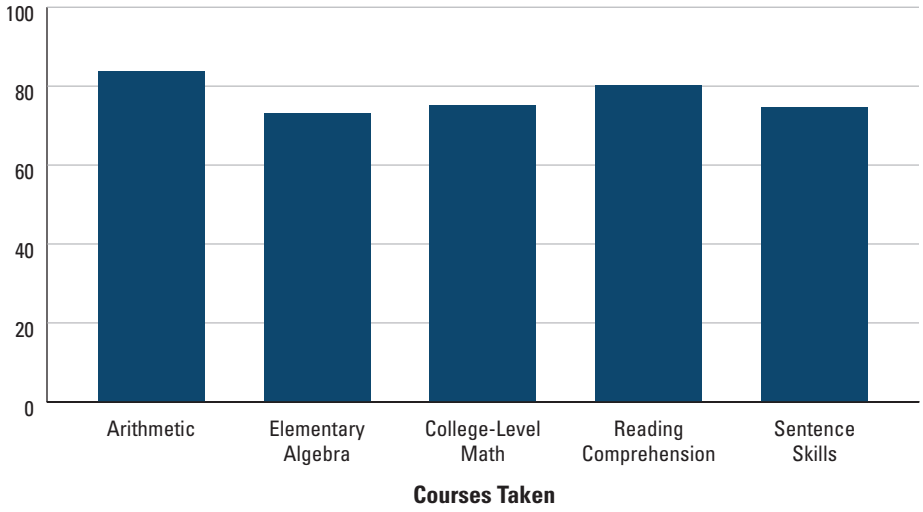


FIGURE 9A

Students Who Earned a C or Higher After Being Correctly Placed Using ACCUPLACER®

Students who are placed into appropriate course work using college readiness tools often achieve success in that course. For example, across courses in a number of disciplines in 17 institutions, different ACCUPLACER tests were used to correctly place at least 70% of students.*

Percentage Correctly Placed

*The percentage "correctly placed" is the percentage of students who were placed in a given course, either development or regular, and subsequently earned a grade of C or higher.

FOUNDATIONAL PRINCIPLE

10

Knowing how to navigate the college-going process matters, as students should be applying to colleges and universities commensurate with their academic abilities.

Many students…

- → Are not applying to schools that meet their academic needs.
- → Make college decisions in which academics is not the primary factor.
- → Make educational decisions more in line with their financial status than their level of academic achievement.

Interventions that address these concerns can cause these students to apply and be admitted to more colleges.

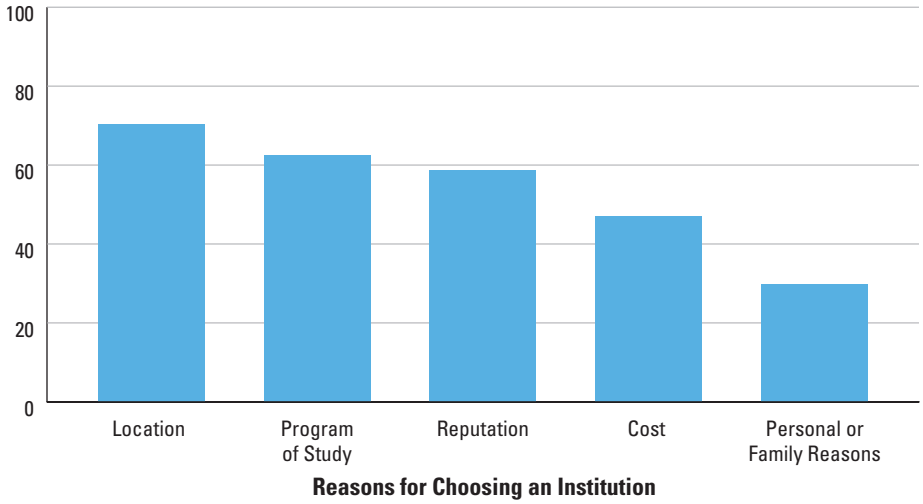


FIGURE 10A

Reasons for Choosing Postsecondary Institution*

Many students are choosing their postsecondary institution on the basis of factors other than the school's academic program of study. While this may be for sound reasons, it can also indicate a lack of access to good information about the importance of academic factors for college completion.

Percentage of Students

*Students were allowed to note multiple reasons.

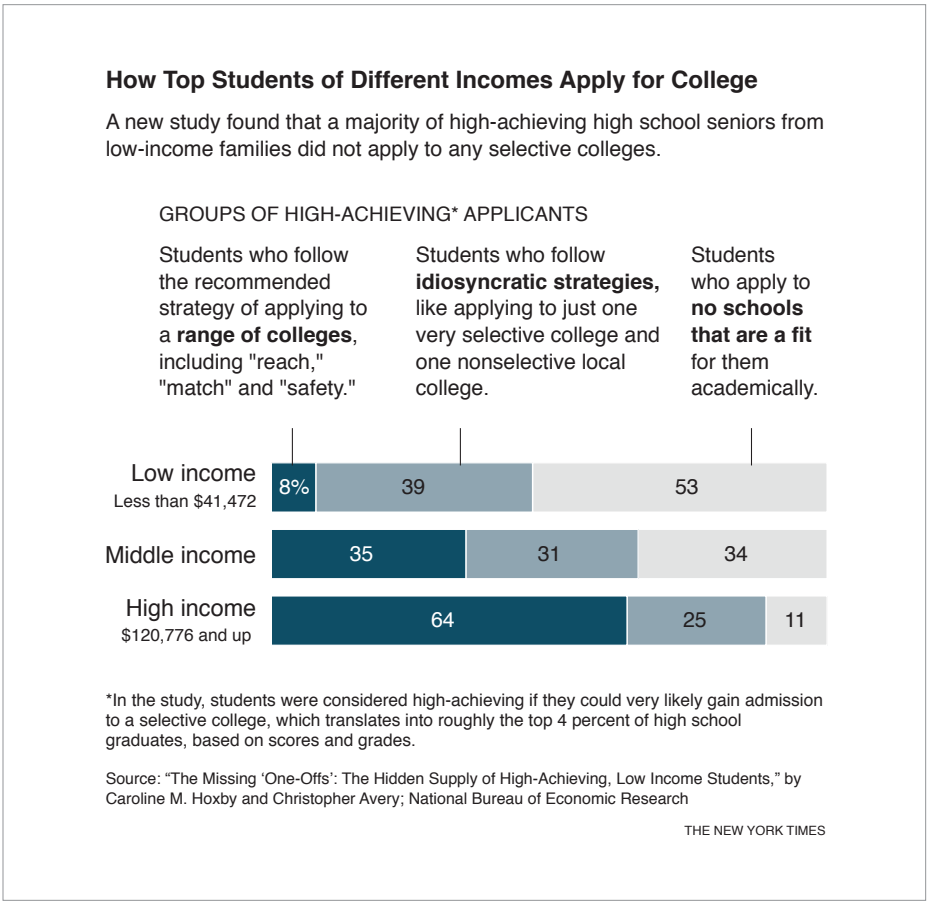


FIGURE 10B

How Top Students with Different Incomes Apply to College

For many students, family income weighs heavily in the college choice process. High-income, high-achieving students are more likely to pursue selective postsecondary alternatives, while low-income, high-achieving students are more likely to pursue nonselective postsecondary alternatives.

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PRINCIPLE 1

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About the College Board

The College Board is a mission-driven not-for-profit organization that connects students to college success and opportunity. Founded in 1900, the College Board was created to expand access to higher education. Today, the membership association is made up of over 6,000 of the world's leading educational institutions and is dedicated to promoting excellence and equity in education. Each year, the College Board helps more than seven million students prepare for a successful transition to college through programs and services in college readiness and college success — including the SAT® and the Advanced Placement Program®. The organization also serves the education community through research and advocacy on behalf of students, educators, and schools. For further information, visit www.collegeboard.org.

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