

AP Students in College: A Review of Key Research

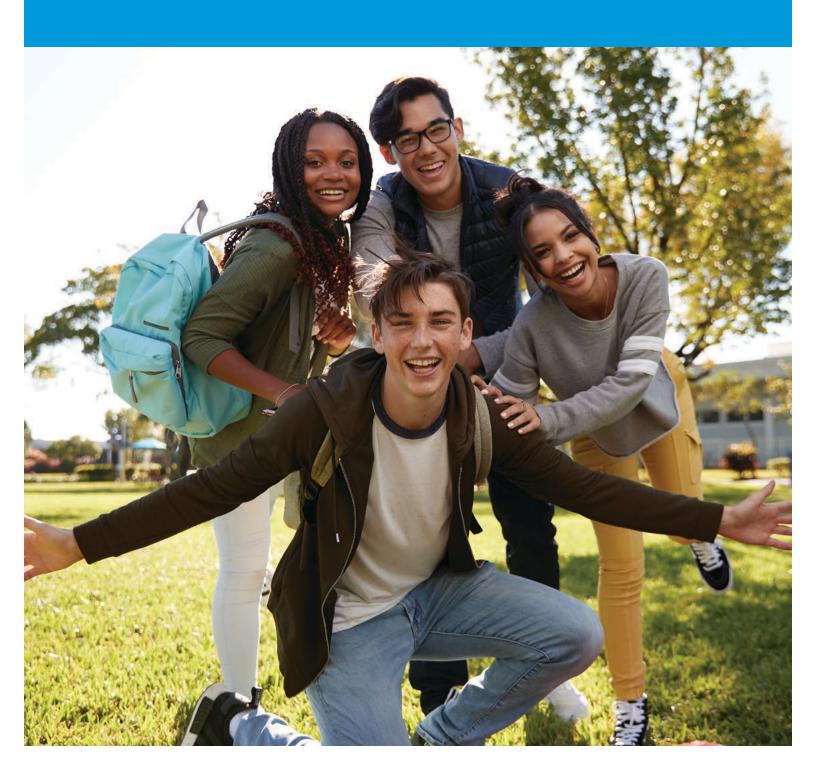


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What is AP?

The Advanced Placement® Program offers high school students an opportunity to pursue college-level coursework in a range of disciplines, including art and design, English, history and social science, STEM, world languages and cultures, and more. Through AP® courses, students can develop the skills and knowledge needed for success once they arrive in college. Each May, they have the opportunity to demonstrate mastery of this knowledge by sitting for nationally administered summative assessments. These exams are scored on a 1–5 scale by a combination of college faculty and experienced teachers; most colleges offer credit or placement or both to students earning qualifying scores of 3 or higher.

While AP Exam scores are often the most visible marker of academic preparedness used by higher education professionals, AP courses provide a rich opportunity for students to challenge themselves; explore an academic interest; and earn college credit, placement, or both.

Currently, more than 22,000 high schools nationally and around the world offer at least one AP course and more than 3 million secondary students take an AP Exam each year. While some students take AP in several subjects during high school, most AP students take only one or two exams before graduating. The modal number of AP Exams across all students is one.

How does AP ensure consistent course rigor across secondary schools?

AP teachers are provided with a detailed course framework and must submit a syllabus for approval before teaching the course. The AP® Program offers teachers a range of ongoing in-person and virtual professional development opportunities, including participation in AP Readings, where high school educators work alongside experienced college faculty to score AP Exams.

How are AP courses and exams developed?

AP course and exam development: The critical role of college faculty

The participation of over 18,000 education professionals from universities and high schools all over the country makes the AP Program the largest K–16 educational collaboration in the world.

COURSES

For each course, a committee of college faculty and experienced high school teachers develop, review, and revise the course framework and syllabus requirements. This committee meets regularly to ensure that each course aligns to current best practices in the discipline and meets college-level expectations.

EXAMS

Exam specifications and questions are developed and reviewed by teams of college faculty, teachers, and assessment specialists. Questions are designed to elicit evidence of student achievement for each learning objective specified in the course framework.

STANDARD-SETTING

Using college course grades as a benchmark, college faculty and teachers define the student performance that correlates with each AP Exam score.

SCORING

Scoring guidelines for free-response questions and performance tasks are developed by college faculty and teachers. At the annual AP Reading, thousands of college faculty and high school teachers convene to score these questions.

AP Validity

Is AP a good measure of students' academic readiness for college overall and in specific disciplines?

A large body of research conducted over the past 20 years has established the validity of Advanced Placement. Completing an AP course and exam is associated with a range of positive postsecondary outcomes for students, including greater likelihood of enrollment in and completion of college, strong first-year performance, and success in subsequent college courses. Those outcomes are true even for AP students who take only one or two AP Exams.

Although students earning AP scores of 3 or higher—the scores for which most colleges grant credit or placement or both—experience the greatest gains, research shows that even students who earn scores of 1 or 2 on an AP Exam derive benefits that lead to college success.¹



AP Exam scores are a strong predictor of college success and degree completion.

KEY FINDINGS

While the data were clear that student participation in AP correlated to academic gains at the college level, the biggest boost in these gains happened when students participated in AP for the first time.

For example, the largest increases in first-year college GPA were associated with students who had taken 1–2 AP Exams. Students who completed their first AP Exam were three percentage points more likely to graduate from college within four years. Students taking an AP Exam and scoring a 3 or higher were six percentage points more likely to graduate from college within four years and eight percentage points more likely if they scored 3 or higher on two AP Exams.

STUDY

Beard, Hsu, Ewing, and Godfrey, 2019²

EXAMINED

AP Exam-taking and AP Exam scores related to first-year GPA (FYGPA) in college and on-time degree completion in four years

SAMPLE AND CONTROLS

400,000+ students across three years attending 100 public and private four-year institutions. Controlled for first-generation status, gender, race/ethnicity, academic characteristics, cohort effects, and AP offerings at each high school

ADDITIONAL RESEARCH

- Students taking an AP Seminar Exam or earning an AP Capstone Diploma[™] had significantly higher first-year college grades and first-to-second-year college retention than similar non-AP students. (Jagesic, Ewing, Feng, and Wyatt, 2020)³
- As students' average AP Exam scores increased, so did mean FYGPAs. (Shaw, Mattern, and Marini, 2012)⁴

² J.J. Beard, J. Hsu, M. Ewing, and K.E. Godfrey. "Studying the Relationships Between the Number of APs, AP Performance, and College Outcomes." Educational Measurement: Issues and Practice, vol. 38, no 4. (Winter 2019): 42–54. https://doi.org/10.1111/emip.12295

³ Sanja Jagesic, Maureen Ewing, Jing Feng, and Jeff Wyatt. AP Capstone™ Participation, High School Learning, and College Outcomes: Early Evidence. 2020. New York: College Board.

⁴ Emily Shaw, Jessica Marini, and Krista Mattern. "Exploring the Utility of Advanced Placement Participation and Performance in College Admission Decisions." Educational and Psychological Measurement, vol. 73, no. 2 (September 2012): 229–253. https://doi.org/10.1177/0013164412454291



AP Exam scores are a strong predictor of college success and degree completion.

FIGURE 1AFYGPA by Number of AP Exams Taken

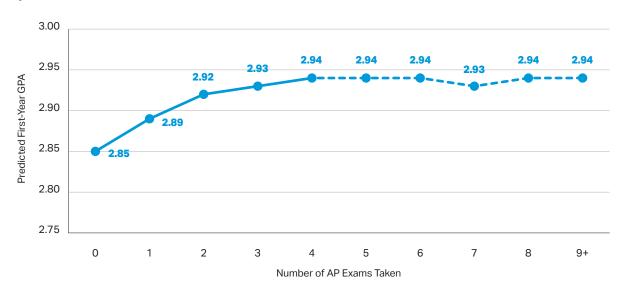
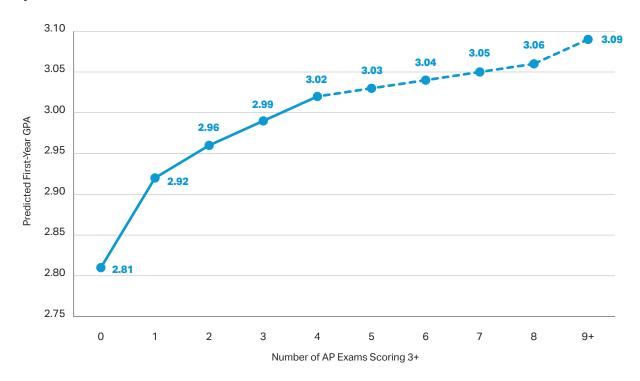


FIGURE 1B FYGPA by Number of AP Exams 3+





AP students who earn a 3 or higher on an AP Exam perform as well as or better than students who take the college's introductory course.

KEY FINDINGS

Students who took an AP Exam and placed into the subsequent course performed as well as or better than non-AP students in most courses studied. AP students earned a mean course GPA of between 0.01–0.85 higher than non-AP students, depending on the course and exam score.

STUDIES

Jagesic and Wyatt, 2022,⁵ Wyatt and Jagesic, 2020,⁶ Jagesic and Wyatt, 2018,⁷ and Wyatt, Jagesic, and Godfrey, 2018⁸

EXAMINED

Subsequent course performance of AP students who earned placement and non-AP students who took the introductory course on the college campus before moving to the subsequent course

SAMPLE

Students attending institutions that agreed to provide data on courses taken and grades earned as part of the College Board's ongoing efforts to evaluate the validity of assessment scores

ADDITIONAL RESEARCH

- Students who took an AP Exam in a STEM subject, regardless of score, had higher STEM first-year college GPAs than non-AP peers. First-generation, underrepresented minority, and female students who scored a 3 or higher on an AP Exam in a STEM subject had higher STEM first-year college GPAs than non-AP peers. (Smith, Jagesic, Wyatt, and Ewing, 2017)⁹
- AP students who earned a 3 or higher on one or more AP science exams performed as well as if not better than similar students who took the counterpart course, on both FYGPA and science GPA. (Kaliski and Godfrey, 2014)¹⁰
- Students who earned a 3 or higher on the AP Exam earned higher GPAs (1st year, 4th year) in college than non-AP students. (Hargrove, Godin, and Dodd, 2008)¹¹

⁵ Sanja Jagesic and Jeff Wyatt. Postsecondary Course Performance of AP Exam Takers in Subsequent Coursework: AP Calculus AB, AP Calculus BC, AP Computer Science Principles, AP European History, AP German Language and Culture, AP Physics 1, AP Physics 2, AP Physics C: Mechanics, AP Physics C: Electricity & Magnetism, AP Psychology, AP Art History. 2022. New York: College Board.

⁶ Jeff Wyatt and Sanja Jagesic. Postsecondary Course Performance of AP Exam Takers in Subsequent Coursework: Chemistry, Comparative Government, English Language, English Literature, Environmental Science, Physics 1, Spanish Language and Culture, U.S. History, and World History. 2020. New York: College Board.

⁷ Sanja Jagesic and Jeff Wyatt. Postsecondary Course Performance of AP Exam Takers in Subsequent Coursework: Biology, Languages, and Studio Art. 2018. New York: College Board.

⁸ Jeff Wyatt, Sanja Jagesic, and Kelly Godfrey. Postsecondary Course Performance of AP Exam Takers in Subsequent Coursework. 2018. New York: College Board.

⁹ Kara Smith, Sanja Jagesic, Jeff Wyatt, and Maureen Ewing. AP STEM Participation and Postsecondary STEM Outcomes: Focus on Underrepresented Minority, First-Generation, and Female Students. 2018. New York: College Board.

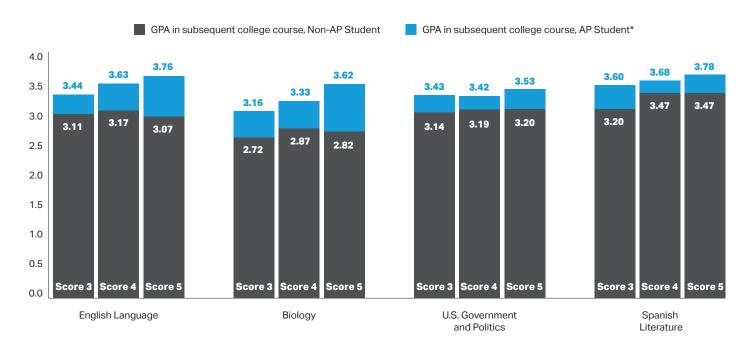
¹⁰ Pamela Kaliski and Kelly Godfrey. Does the Level of Rigor of a High School Science Course Matter? An Investigation of the Relationship Between Science Courses and First-Year College Outcomes. College Board Research Report, no. 2014-2. New York: College Board.

¹¹ Linda Hargrove, Donn Godin, and Barbara Dodd. College Outcomes Comparisons by AP and Non-AP High School Experiences. College Board Research Report, no. 2008-3. New York: College Board.



AP students who earn a 3 or higher on an AP Exam perform as well as or better than students who take the college's introductory course.

FIGURE 2
Mean GPA in the Subsequent College Course by AP Exam Participation and Performance



^{*}P < 0.05; values for AP columns denote the difference relative to the non-AP mean GPA.



AP Credit & Placement

How do students use the credit and placement earned through scores on AP Exams?

The promise of credit or placement or both in college is one of the most important drivers of student participation in AP; in fact, 73% of AP Exam takers reported that the college credit and placement influenced their decision to take the exam a great deal. Once students arrive on campus, studies show that they often use the credit they've earned through AP to include additional courses in their schedules and to ensure on-time graduation. Multiple studies have associated AP Exam–taking with higher rates of on-time graduation.

For college faculty looking to recruit students for their departments, AP can be a good indicator of student interest in a particular subject; students often go on to take additional college courses in their AP subject. For example, AP STEM exam takers take 19% more higher-level courses within their AP subject in their first year of college.

¹² College Board. Year-End AP Student Survey, 2019–2020.

¹³ Studies have associated student AP Exam-taking with college graduation in four or five years. According to the National Center for Education Statistics (NCES), the majority of students earning a four-year degree do so within six years. https://nces.ed.gov/programs/coe/indicator/ctr/undergrad-retention-graduation



Students taking AP Exams are more likely to complete a major in their AP subject or in a related discipline.

KEY FINDINGS

Overall, students who took an AP STEM exam had a 13% higher probability of STEM major completion than matched non-AP STEM peers. Even students scoring a 1 or 2 on an AP STEM exam had a 6% higher probability of completing a STEM major than non-AP peers, while those earning scores of 3, 4, and 5 had a 19% higher probability.

This effect held true for students traditionally less likely to participate in STEM disciplines—female, underrepresented minority, and first-generation students—when analyzed separately in comparison to non-AP peers.

STUDY

Smith, Jagesic, Wyatt, and Ewing, 2018¹⁴

EXAMINED

FYGPA in STEM and STEM major completion for AP and matched non-AP students

SAMPLE AND CONTROLS

College Board database of 43 four-year colleges and the College Board student cohort file. **Sample 1:** 9,690; **Sample 2:** 4,648; **Sample 3:** 5,042. Analyzed PSAT/NMSQT® scores, gender, race/ethnicity, first-generation status, and self-reported interest in majoring in STEM

ADDITIONAL RESEARCH

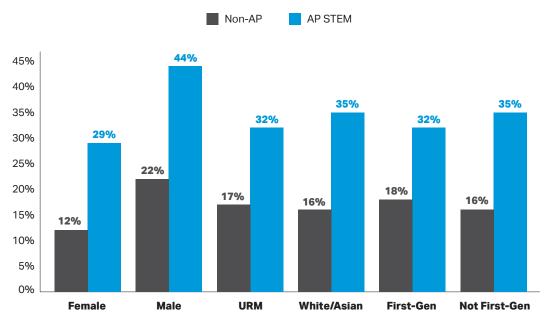
- Students who took both AP economics exams were more likely to complete an
 economics major than non-AP students who took the introductory college course
 sequence. (Ahlstrom, 2020)¹⁵
- Students who took AP Computer Science Principles (CSP) were more likely to declare a computer science major than non-CSP students of similar ability and background. This finding was particularly true for students underrepresented in computer science. (Wyatt, Feng, and Ewing, 2020)¹⁶
- Attaining higher scores on an AP Exam increases the probability that a student will major in that subject by approximately 5% on average, with some subjects demonstrating increases as high as 30%. (Avery, Gurantz, Hurwitz, and Smith, 2016)¹⁷
- Students who took the AP Computer Science A (CSA) Exam were 46% more likely to indicate interest in a computer science major. Women were 38% more likely to pursue a computer science degree after having taken AP CSA in high school. (Google, 2014)¹⁸
- Across all content areas, results revealed a positive relationship between AP participation and majoring in a related field in college. (Mattern, Shaw, and Ewing, 2011)¹⁹



Students taking AP Exams are more likely to complete a major in their AP subject or in a related discipline.

FIGURE 3

Proportion of Students Graduating with a STEM Major: AP Exam Takers Scoring a 3+ and Matched Non-AP Students



Smith, Jagesic, Wyatt, and Ewing, 2018

¹⁴ Kara Smith, Sanja Jagesic, Jeff Wyatt, and Maureen Ewing. AP STEM Participation and Postsecondary STEM Outcomes: Focus on Underrepresented Minority, First-Generation, and Female Students. 2018. New York: College Board.

¹⁵ Laura Ahlstrom. "Does Advanced Placement Economics Exam Participation and Performance Predict Undergraduate Economics Major Completion?" The American Economist, vol. 66, no. 1 (March 2021): 110–127. https://doi.org/10.1177/0569434520973682

¹⁶ Jeff Wyatt, Jing Feng, and Maureen Ewing. AP Computer Science Principles and the STEM and Computer Science Pipelines. 2020. College Board: New York.

¹⁷ Christopher Avery, Oded Gurantz, Michael Hurwitz, and Jonathan Smith. "Shifting College Majors in Response to Advanced Placement Exam Scores." National Bureau of Economic Research Working Paper Series, paper 22841: (November 2016). https://doi.org/10.3386/w22841

¹⁸ Google, "Women Who Choose Computer Science—What Really Matters: The Critical Role of Encouragement and Exposure." (May 26, 2014). https://static.googleusercontent.com/media/edu.google.com/en//pdfs/women-who-choose-what-really.pdf

¹⁹ Krista Mattern, Emily Shaw, and Maureen Ewing. Advanced Placement Exam Participation: Is AP Exam Participation and Performance Related to Choice of College Major? 2011. College Board Research Report, no. 2011-6. The College Board: New York.



KEY FINDINGS

Additional college credits earned through qualifying scores on AP Exams were associated with a range of positive outcomes, including:

- A 4-percentage point increase in students' likelihood of graduating within 6 years
- A 7-percentage point increase in the likelihood of double majoring
- Earning additional lab science and advanced math credits
- The reduction of approximately \$1,000 in student debt (likely driven by a reduction in the time to degree)

STUDY

Evans, 2019²⁰

EXAMINED

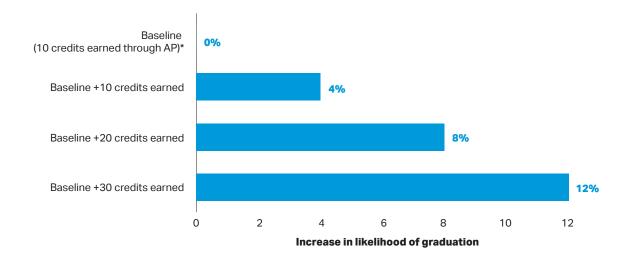
The relationship between college credit earned through AP and college outcomes using 10 credits earned (the average for students in the sample) as a benchmark

SAMPLE AND CONTROLS

14,830 students from the Beginning Postsecondary Students (BPS) Longitudinal Dataset. Controlled for SAT®, HSGPA, gender, race, citizenship status, age, amount of Title IV aid received, whether student was nontraditional (over age 24), and first-generation status



FIGURE 4Likelihood of Graduation Within Six Years: Baseline and Additional Credit Earned Through AP



Evans, 2016

*At many colleges, 10 credits could be earned by achieving qualifying scores on 2–4 AP Exams, depending on discipline and AP policy.



KEY FINDINGS

Earning credit for non-STEM AP Exams increased students' overall coursework in non-STEM courses and increased the breadth of study across departments.

Students who earned credit for at least one AP STEM exam were significantly more likely to take additional STEM courses in college. For female students, AP STEM credit increased participation in AP Exam subject courses by 12% and for STEM courses overall by 9%. Earning AP credit reduced the male-female gap in STEM participation by one-third to two-thirds.

STUDY

Gurantz, 2019²¹

EXAMINED

College courses taken by students earning credit for AP and by those who did not earn credit

SAMPLE AND CONTROLS

70,700 students graduating from two- and four-year public colleges across three years in one large state. Controlled for gender, ethnicity, SAT taking, SAT performance, total AP Exams taken, parental education, and reported income

ADDITIONAL RESEARCH

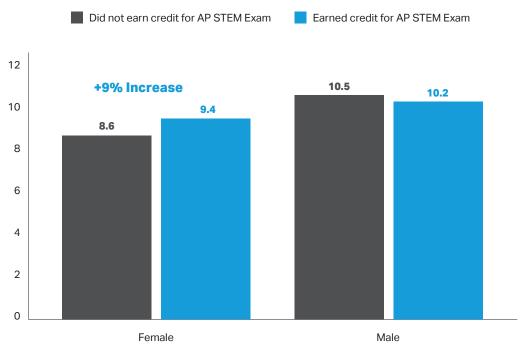
Students who earned a 3 or higher on at least one AP Exam were more likely to double major than those who did not. (Ewing, Jagesic, and Wyatt, 2018)²²

²¹ Oded Gurantz. "How College Credit in High School Impacts Postsecondary Course-Taking: The Role of AP Exams." Education Finance and Policy, vol. 16, no. 2 (April 2021): 233–255. https://doi.org/10.1162/edfp_a_00298

²² Maureen Ewing, Sanja Jagesic, and Jeff Wyatt. Choosing Double: The Relationship Between Successful AP Exams and College Double Major. 2018. New York: College Board.



FIGURE 5
Total STEM Courses After Four Years



Gurantz, 2019



AP Expansion

AP has expanded significantly in the 21st century. Has the program quality changed? How has greater access to AP impacted underrepresented students?

Between 2001 and 2020, the number of secondary schools offering AP Exams to at least one student more than doubled. Correspondingly, the number of U.S. public high school students taking at least one AP Exam over the course of high school more than doubled as well.²³

Rather than resulting in more AP courses per student, this expansion has allowed a broader population of students to take advantage of the opportunity represented by AP. Most students take only one or two exams; in fact, the modal number of exams taken by students over the course of their time in high school has remained one since 2001.

Since the early 2000s, access to AP has grown among a range of students traditionally underrepresented in education.²⁴ During this time,

- the share of AP Exam takers using a fee reduction²⁵ to take an AP Exam increased by 19 percentage points, and
- the share of AP Exam takers from underrepresented minority groups increased by 17 percentage points.

Research suggests that access to AP among these underrepresented groups has resulted in positive postsecondary academic outcomes, including greater retention and graduation, and likelihood of majoring in their AP discipline.

 $^{^{\}rm 23}$ College Board. AP cohort data, 2001 and 2020.

 $^{^{\}rm 24}$ College Board. AP cohort data, 2004 and 2020.

²⁵ College Board has different eligibility criteria for AP Exam fee reductions, depending on whether a school or district participates in the Community Eligibility Provision (CEP), a program that enables high-poverty U.S. schools and districts to offer breakfast and lunch at no charge to all students.



As AP has expanded into more high schools, student achievement has remained consistent.

KEY FINDINGS

The data showed that even as the AP Program expanded significantly over nine years, AP students' achievement remained consistent.

STUDY

Malkus, 2016²⁶

EXAMINED

AP student performance on the National Assessment of Educational Progress (NAEP) over 10 years

SAMPLE AND CONTROLS

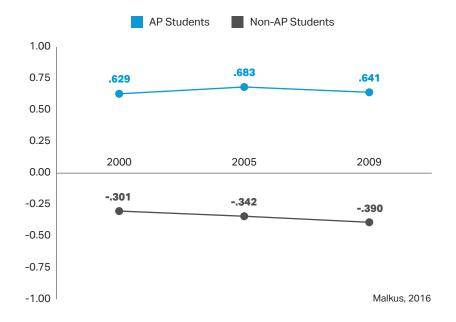
High school graduates drawn from the NCES high school transcript study and the High School Longitudinal Study



As AP has expanded into more high schools, student achievement has remained consistent.

FIGURE 6

Standardized 12th-Grade Mathematics NAEP Scores of Public High School Graduates by AP Participation: 2000, 2005, and 2009





Low-income students who take AP Exams tend to have better enrollment, persistence, and graduation rates than academically similar low-income peers.

KEY FINDINGS

Across multiple subject areas, low-income AP students, when compared to their low-income non-AP Exam-taking peers, tended to have higher likelihoods of enrolling, persisting, and graduating from four-year colleges.

STUDY

Godfrey, Wyatt, and Beard, 2016²⁷

EXAMINED

College outcomes for low-income AP students and low-income non-AP students of similar ability

SAMPLE AND CONTROLS

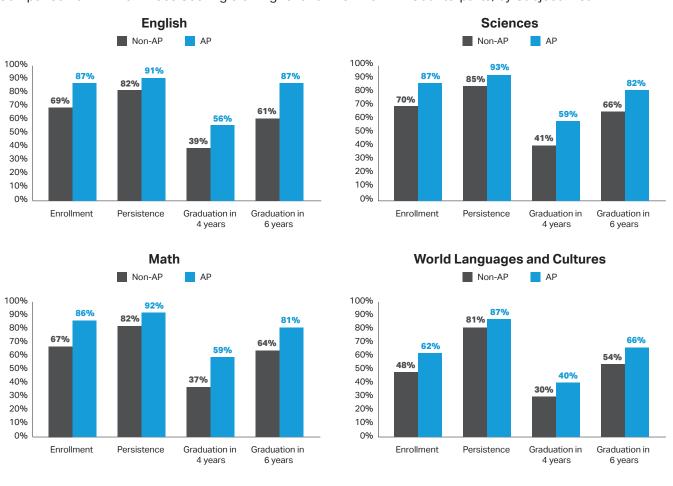
Matched student samples, ranging in size from 13,468 to 25,634 depending on subject, drawn from National Student Clearinghouse data and College Board data. AP students were classified as low-income if they received an AP fee reduction; non-AP students were classified as low-income if they reported an annual household income of \$30,000 or less. Controlled for high school GPA, SAT scores, participation in a particular AP discipline, and participation in other AP disciplines

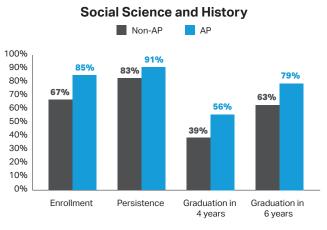
²⁷ Kelly Godfrey, Jeffrey Wyatt, and Jonathan Beard. Exploring College Outcomes for Low-Income AP Exam Takers with Fee Reductions. 2016. College Board Research Report 2016-2. New York: College Board.



Low-income students who take AP Exams tend to have *better enrollment*, *persistence*, *and graduation rates* than academically similar low-income peers.

FIGURE 7
Comparison of AP Examinees Scoring 3 or Higher and Their Non-AP Counterparts, by Subject Area





Godfrey, Wyatt, and Beard, 2016



When access to AP Computer Science Principles (CSP) is expanded among underrepresented minority groups, they are *more likely to major in computer science* than non-CSP students of similar ability and background.

KEY FINDINGS

The launch of AP Computer Science Principles (CSP) in 2016 provided an opportunity to study the effects of AP expansion at scale. Results showed that AP CSP students—particularly those in underrepresented minority groups—were more likely to declare a major in computer science at the start of college than non-CSP students of similar ability and background. Black students were three times more likely to later enroll in another AP computer science course if they took CSP.

Data also suggested that CSP served as a stepping stone to other AP STEM coursework: AP CSP was the first AP STEM course for more than half of CSP students, and more so for Black students (68%), Hispanic students (59%), and first-generation students (60%).

STUDY

Wyatt, Feng, and Ewing, 2020²⁸

EXAMINED

Students who took the AP Computer Science Principles Exam in high school and non-AP students who graduated high school before the course was offered

SAMPLE AND CONTROLS

National Student Clearinghouse²⁹ data and College Board data. Students were matched on gender, ethnicity, high school GPA, parental education, and SAT score

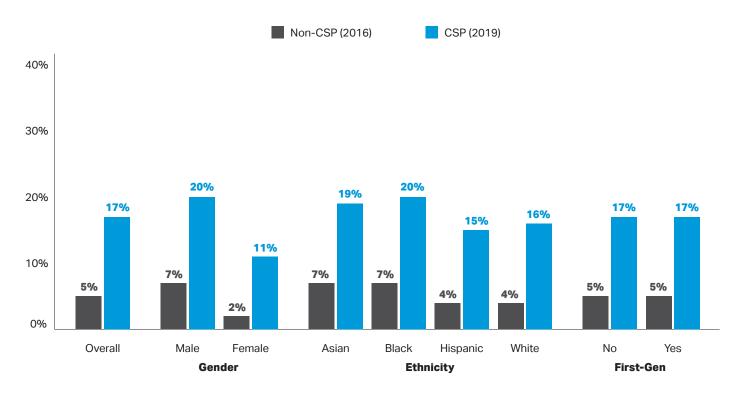
²⁸ Jeffrey Wyatt, Jing Feng, and Maureen Ewing. AP Computer Science Principles and the STEM and Computer Science Pipelines. (December 2020). New York: College Board.

²⁹ The National Student Clearinghouse is a nonprofit organization that provides educational reporting, data exchange, verification, and research services.



When access to AP Computer Science Principles (CSP) is expanded among underrepresented minority groups, they are *more likely to major in computer science* than non-CSP students of similar ability and background.

FIGURE 8
Percentage of CSP and Non-CSP Students Majoring in Computer Science



Wyatt, Feng, and Ewing, 2020



Next Steps

How can my department use information about the AP courses and exams in our subject area?

- Ensure that your institution's AP policy is expressed clearly and transparently, and is easily accessible on your website.
 - College Board surveys have shown that 39% of students would consider enrolling in a different college if it were to offer a more attractive AP policy.³⁰
 - Review our recommendations on setting a credit and placement policy on your campus.
- Review information provided by College Board on AP students overall, at your institution, and within specific disciplines, including the following:
 - Data on AP students by race/ethnicity to help you diversify the pipeline of qualified students into your department
 - Custom reports of AP score-sending by students who have matriculated to your institution
 - Released AP Exams from past years
 - Overall student performance by score band
- As a college faculty member, participate in AP directly by:
 - Scoring AP Exams
 - Providing input into the AP Program as a Visiting Fellow or a Virtual Fellow
 - Attending an AP Higher Ed Symposium or other higher education event
 - Serving on a course development or standard-setting committee
- When you are reviewing your institution's AP policy, make sure that it aligns with your institution's goals. AP provides tools to help you make informed decisions.
 - Credit-granting recommendations from the American Council on Education (ACE)
 - A correlation of AP Exam scores to college course grades
 - Recent research
 - Evaluate the success of your AP policy by requesting a customized
 AP Placement Validity Study, offered through the College Board's
 Admitted Class Evaluation Service™ (ACES™). This free study uses data
 you provide to compare the performance of AP students and non-AP
 students attending your institution.

About AP

The College Board Advanced Placement* Program (AP*) enables willing and academically prepared students to pursue college-level studies—with the opportunity to earn college credit, advanced placement, or both—while still in high school.

For further information, visit collegeboard.org/aphighered or contact aphighered@collegeboard.org.