

Fulfilling the Promise: The Potential of Advanced Placement to Improve College Outcomes for Black, Latino, and Low-Income Students

— Dr. Sarah Fierberg Phillips

The U.S. economy requires a highly educated workforce. Ninety nine percent of all new jobs created between January 2010 and January 2016 went to workers with at least some college education¹, and the U.S. government projects that nearly forty percent of jobs will require at least some college by 2028.² Yet deep and persistent racial, ethnic, and socioeconomic disparities in college outcomes threaten the country’s ability to meet its workforce needs.

This is particularly problematic during the current moment, as the Coronavirus pandemic dramatically

impacts teaching and learning. Researchers estimate that widespread school closures will result in students returning to school in fall 2020 with 63-68% of the learning gains in reading relative to a typical school year and 37-50% of learning gains in math.³ They also predict there will be wide variability among students—variability that puts Black, Latino, and low-income students at greatest risk.⁴ Estimating the learning loss associated with different return-to-school scenarios, one study estimates the average student will lose approximately 6.8 months of schooling if students are able to return to in-person schooling in January 2021. Among Black, Latino, and low-income students, learning loss is estimated to be 10.3, 9.2, and 12.4 months respectively.⁵

Mass Insight’s AP STEM & English program is a school-level intervention well-suited for the current moment. The intervention improves AP participation and performance, and program participants enroll, persist, and graduate from two- and four-year institutions at higher rates than the average Massachusetts high school senior. Although rates of improvement have historically been strongest among Black, Latino, and low-income students, the AP STEM & English program was not specifically designed to close racial, ethnic, and socioeconomic gaps in AP participation and performance or college outcomes. In fact, the program has also increased participation and performance of White, middle income students, albeit at lower rates. However, program data offer a useful opportunity to evaluate AP’s promise as a high-leverage strategy for closing persistent racial, ethnic, and socioeconomic disparities in college

Key Takeaways

- Introducing diverse students to the rigors of AP and supporting their success is a promising strategy for improving college readiness and success.
- Mass Insight’s AP STEM & English program improves AP participation and performance, particularly among Black, Latino, and low-income students.
- AP STEM & English program participants also outperform students statewide in college matriculation, persistence, and graduation.
- Although the AP STEM & English program was not designed to close racial, ethnic, and socioeconomic gaps in AP participation and performance or college outcomes, program data offer a useful opportunity to evaluate AP’s promise as a high-leverage strategy for closing persistent racial, ethnic, and socioeconomic disparities in college outcomes.
- Analyses suggest that improving AP participation and performance among Black, Latino, and low-income students relative to White mid- to high-income students will narrow but not completely eliminate corresponding disparities in college outcomes.
- To maximize the gap-closing potential of AP interventions, practitioners may wish to consider explicitly targeting additional supports to Black, Latino, and low-income students or embedding AP into more holistic college readiness interventions.

outcomes. Findings suggest that efforts to ensure Black, Latino, and low-income students participate in AP as often and perform as well on AP exams as mid- to high-income White students may narrow disparities in college outcomes, but equalizing AP participation and performance will not close these gaps entirely. To maximize AP's gap-closing potential, practitioners should consider embedding AP into more holistic college readiness interventions and more explicitly targeting Black, Latino, and low-income students.

Racial, Ethnic, and Socioeconomic Disparities in College Outcomes

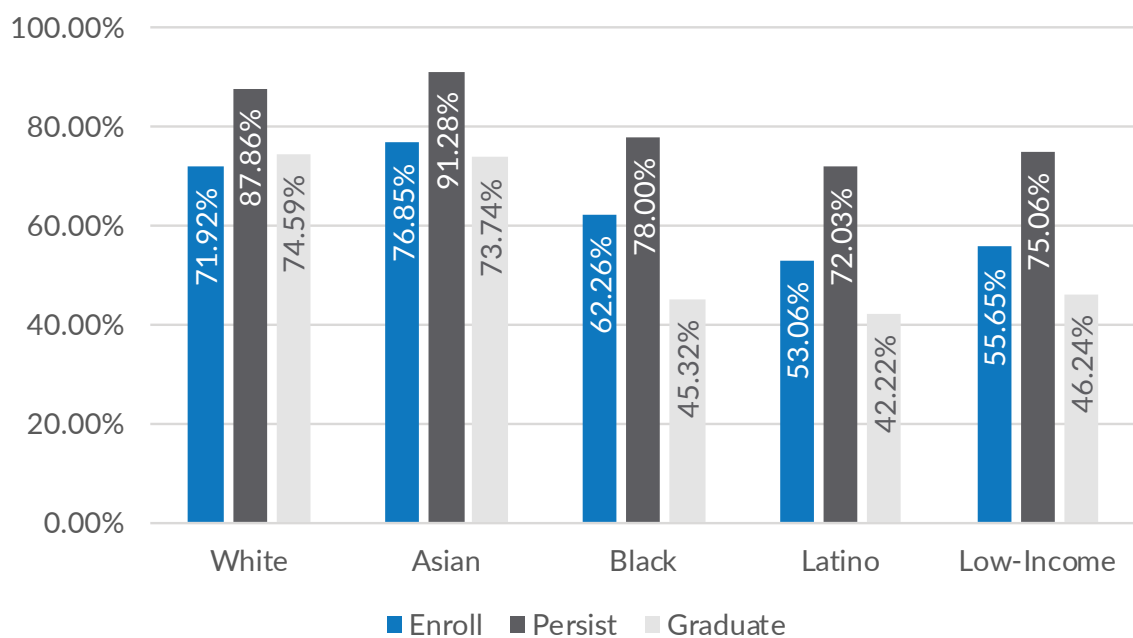
Deep and persistent racial, ethnic, and socioeconomic disparities in college enrollment, persistence, and graduation mean that many students leave school without the credentials they need to succeed in the U.S. economy. Using data from

Massachusetts, Figure 1 illustrates these disparities as well as their cascading effect over time. Whereas 76.85% and 71.92% of Asian and White students in the class of 2011 were enrolled in college by the October following their high school graduation, just 62.26% of Black students, 55.65% of low-income students, and 53.06% of Latino students did the same. Further, among students who immediately enrolled in college, persistence and graduation rates are approximately 10 to 30 percentage points higher among Asian and White students compared to Black, Latino, and low-income students.

The Promise of Advanced Placement

Policy-makers and practitioners have argued that the College Board's AP program can help close racial, ethnic, and socioeconomic disparities in college readiness.⁶ Describing AP's potential to eliminate socioeconomic disparities in college

Figure 1: Persistence and Graduation Rates Among MA Students in the Class of 2011 Who Immediately Enrolled in College



Note: Persistence and graduation rates are calculated from the population of students immediately enrolling in a two- or four-year institution.

Source: MA Department of Elementary and Secondary Education, DART Detail: Success after high school (Malden, MA: Author, November 2019). Retrieved January 22, 2019 from : <http://www.doe.mass.edu/dart/>.

matriculation, Terry Peterson, Senior Advisor to former U.S. Secretary of Education, Richard Riley, declared, “Talk about leveling the playing field. There are very few things you can find in education that you find this stark of a difference.”⁷

But empirical evidence suggests the promise of AP has not yet been fully realized. Although enrolling in an AP course is a clear signal of a student’s intent to attend college,⁸ AP course-taking is generally considered a weak predictor of college matriculation, persistence, and grade point average once other measures of academic achievement and motivation are accounted for.⁹ AP performance, as measured by a student’s AP exam score, is a much stronger predictor of college outcomes. Quasi-experimental research suggests earning a qualifying score—a score of three, four, or five on an AP exam, is causally related to college matriculation,¹⁰ persistence,¹¹ grades,¹² and graduation.¹³

Together these findings suggest that interventions aimed at expanding the number of students who earn qualifying scores on AP exams could be an effective mechanism for improving college outcomes. However, significant racial, ethnic, and socioeconomic disparities exist with respect to exam participation and the distribution of qualifying scores.¹⁴ Some of these disparities are related to student assignment. In analyses conducted using data from the Council on Great City Schools’ class of 2014, the College Board found that 52.47% of students of color with the potential to succeed on an AP exam, as measured by PSAT scores, did not take an exam in that subject.¹⁵

But racial, ethnic, and socioeconomic disparities in qualifying scores are also likely related to corresponding disparities in academic

preparation.¹⁶ A recent study offers support for both explanations, suggesting that 50 percent of Black-White and Latino-White gaps in advanced coursework participation can be explained by racial and ethnic differences in prior achievement, while 25 percent of the gap can be explained by within-school assignment differences.¹⁷ Others conclude that half the socioeconomic advantage in advanced coursework participation can be explained by differences in pre-enrollment academic performance.¹⁸

Efforts to leverage AP to close racial, ethnic, and socioeconomic gaps in college outcomes must first address corresponding disparities in AP participation and performance. Black, Latino, and low-income students are less likely to be given the opportunities to participate in AP classes than their White, middle-class counterparts and are also more likely to have insufficient academic preparation to succeed. Both these factors contribute to gaps in AP participation and performance and must be addressed if AP is to help close racial, ethnic, and socioeconomic disparities in college readiness.

A Model AP Program

Mass Insight’s AP STEM & English program is a research-based replication program that has been implemented in nearly 140 schools across Massachusetts, serving over 45,000 students. Established in fall 2008 through a grant from the National Math and Science Initiative (NMSI), the AP STEM & English program is based on the Advanced Placement Training and Incentive Program but has been modified over time. It is a school-level intervention designed to improve AP participation and performance with the goal of helping students—particularly Black, Latino, and low-income students—

matriculate, persist, and graduate from college and has been heralded by the College Board and the Department of Elementary and Secondary Education for helping Massachusetts lead the nation in the percent of graduating seniors scoring a three or higher on at least one AP exam.¹⁹

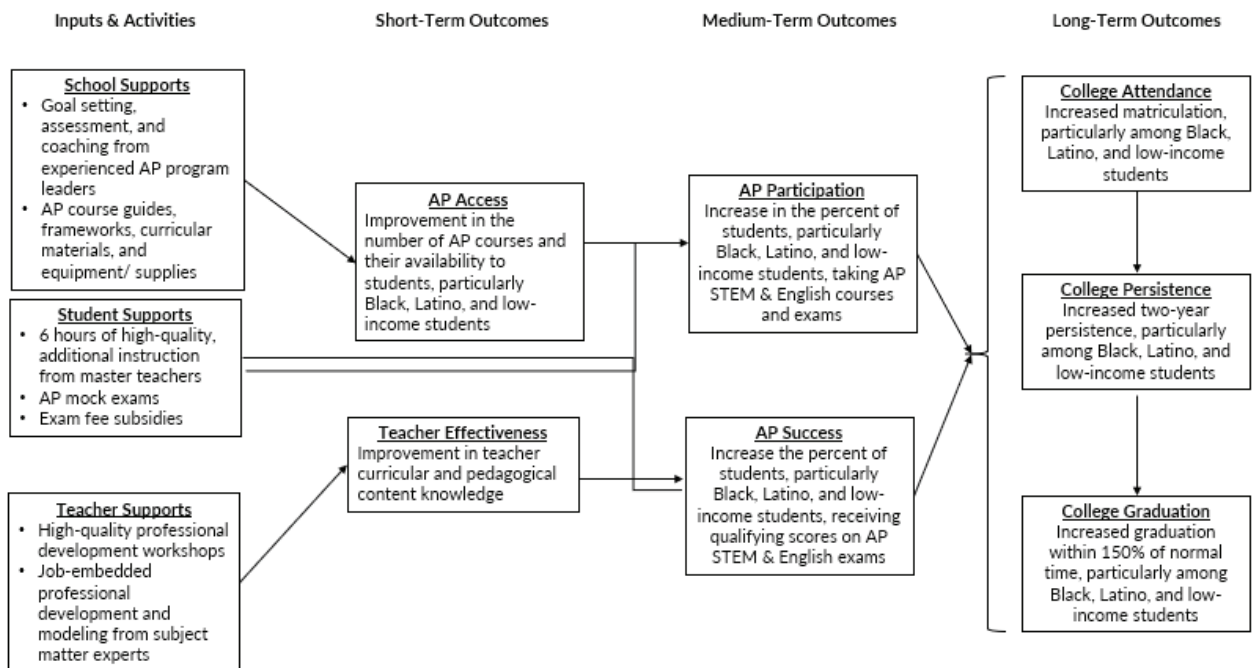
Theoretical Framework. Figure 2 illustrates the theoretical framework underpinning the program. Drawing on research demonstrating a relationship between AP performance on the one hand and college outcomes on the other,²⁰ program activities are designed to improve AP participation and performance, particularly among Black, Latino, and low-income students. Inputs fall into three categories: school supports, teacher supports, and student supports.

School Supports. School supports draw on research demonstrating an association between academic achievement and data-driven school

improvement planning.²¹ In this category of activities, Mass Insight staff share best practices for improving AP participation, including prioritizing Black, Latino, and low-income students, establishing open access policies, and setting equity goals.²² They help school administrators set goals, make plans, and track progress over time. Mass Insight also funds equipment and supply purchases, which prior research suggests should improve the fidelity with which schools implement the AP curriculum.²³

Together, school supports—best practices, data-driven school improvement planning, equipment and supplies—are hypothesized to increase the number of AP sections and courses offered in participating schools and their availability to Black, Latino, and low-income students. Drawing on College Board research, these changes are hypothesized to improve AP participation among Black, Latino, and low-income students.²⁴

Figure 2: AP STEM & English Program Logic Model



Source: Mass Insight Education & Research Institute, Inc.

Teacher Supports. Teacher supports combine high-quality stand-alone workshops with job-embedded professional development and modeling. Drawing on best practices in professional development, teachers new to the AP STEM & English program participate in a one-week summer institute and all teachers are invited to participate in a two-day fall training designed to facilitate curricular coherence and pedagogical content knowledge through active learning.²⁵

Teachers also receive periodic, job-embedded professional development to enhance the effectiveness of the professional development they receive at stand-alone workshops.²⁶ Outstanding former AP teachers observe current AP teachers in action, offer feedback, model effective instruction, and facilitate reflective dialogue. These behaviors are consistent with, although substantially less-intensive than, the concept of instructional coaching,²⁷ which has been associated with improvements in teacher practice.²⁸ Each teacher is expected to receive at least three job-embedded sessions annually.

Finally, teachers are invited to observe Saturday Study Sessions. Described in more detail below, Saturday Study Sessions are led by outstanding AP teachers. While their primary focus is student support, they allow current teachers to see what highly effective AP instruction looks like. This is important because modeling has been shown to improve teachers' implementation of new strategies in the classroom.²⁹

Together, teacher supports—modeling, job-embedded professional development, and stand-alone workshops—are hypothesized

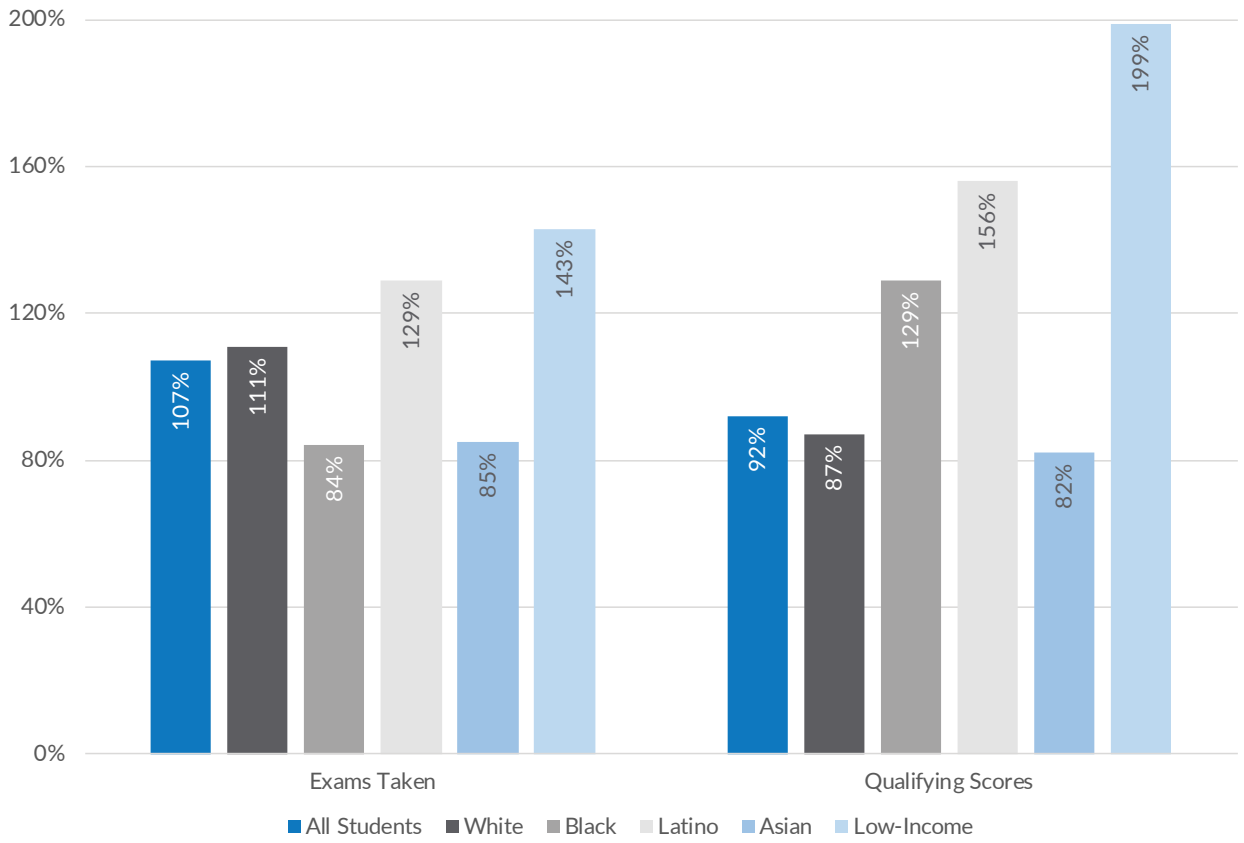
to improve the effectiveness of AP teachers. Because teacher effectiveness strongly predicts student achievement, improvements in teacher effectiveness are hypothesized to predict corresponding improvements AP performance, particularly among Black, Latino, and low-income students.³⁰

Student Supports. Drawing on research demonstrating that time-on-task³¹ and teaching effectiveness³² predict student achievement; student supports include two Saturday Study Sessions or nine additional hours of AP instruction facilitated by outstanding educators. Because practice tests can improve both learning and test performance, student supports also include a 4.5 hour mock exam that is scored and returned to students and teachers mid-way through the year.³³ Finally, low-income students receive exam-fee subsidies, which have been shown to improve AP exam participation in this population.³⁴

Together, student supports—Saturday Study Sessions, mock exams, and exam fee subsidies—are hypothesized to improve the participation and performance of Black, Latino, and low-income students in AP.

Duration. The typical school receives the full array of school, teacher, and student supports for three years. Some schools elect to continue these supports for a fourth, fifth, or even a sixth year, while most transition to a less intensive program where they choose which supports to receive. The vast majority of schools choose to continue teacher professional development workshops and student supports and participate in the less

Figure 3: Improvements in AP Participation and Performance



Note: Analyses aggregate data across 104 schools participating in the AP STEM & English program between 2008-2009 and 2018-2019.

Source: Mass Insight Education & Research Institute, Inc.

intensive program for two to four additional years.

The AP STEM & English Program Improves AP Participation & Performance

Mass Insight's AP STEM & English program greatly increases the number of students taking an AP exam and earning a qualifying score. In aggregate, after three years of core programming, participating schools between 2008-2009 and 2018-2019 have increased the number of exams taken and the number of qualifying scores received by 107% and 92% respectively over the baseline year (Figure 3).³⁵ Among Black, Latino, and low-income students these increases are respectively 84%, 129%, and 143% for exams taken and 129%, 156%, and 199% for qualifying scores. Notably, with the exception of exams taken among Black students, improvements in exams taken and qualifying scores have been

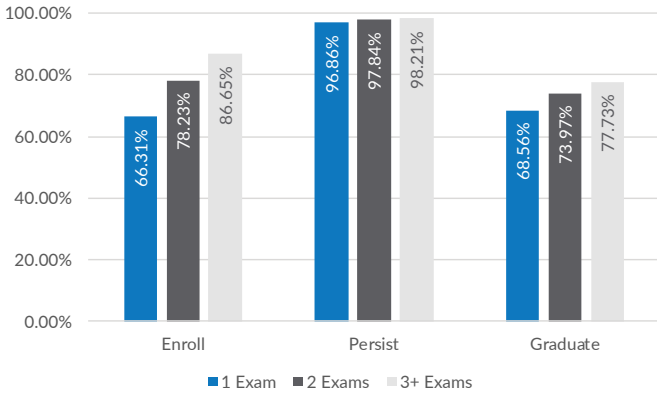
larger among Black, Latino, and low-income students than comparable increases among White and Asian students.³⁶

AP Participation and Performance Predict College Outcomes Among AP STEM & English Participants

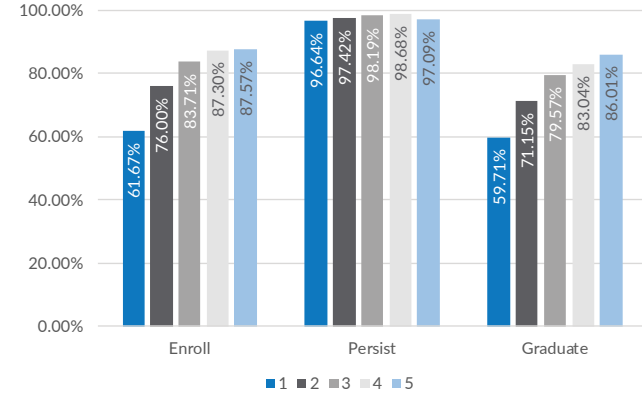
Research shows that more is better when it comes to AP. As illustrated in Figure 4, college matriculation, persistence, and graduation rates are higher for students who take three or more AP exams, as opposed to one or two exams. Similar trends are observed among students whose highest AP exam score is a five compared to a four, three, two, or one. With one exception (persistence rates among students whose average AP exam score is a five), college outcomes improve as students' average scores increase.

Figure 4: College Outcomes by AP Participation and Performance

Participation



Performance



Note: Percentages are the predicted probability of each outcome calculated from multivariate logistic regression results presented in Appendix A, Table A1. Aside from the number of exams taken, all other variables are held constant at the sample mean.

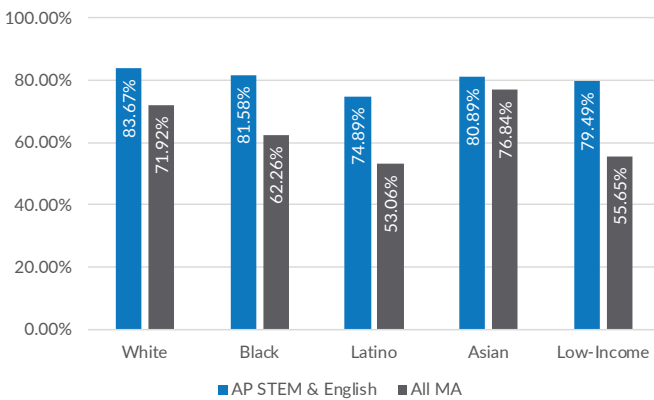
Source: Mass Insight Education & Research Institute, Inc.

Note: Percentages are the predicted probability of each outcome calculated from multivariate logistic regression results presented in Appendix A, Table A1. Aside from average exam score, all other variables are held constant at the sample mean.

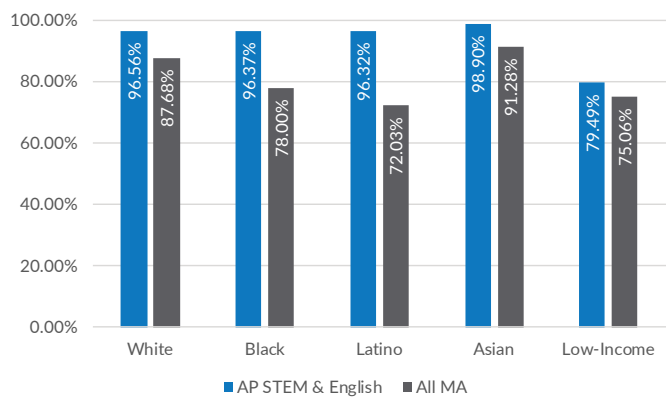
Source: Mass Insight Education & Research Institute, Inc.

Figure 5: College Outcomes for the Class of 2011

Enrollment



Persistence



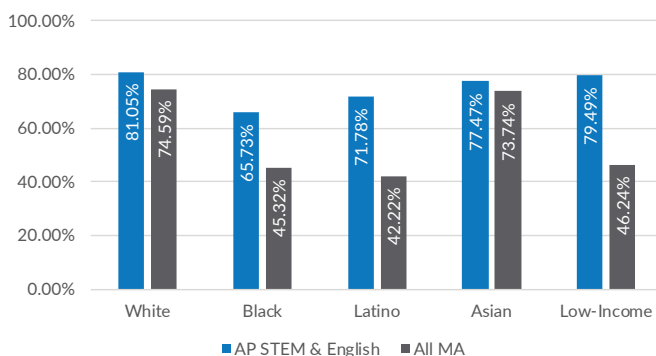
Note: Percentages are the simple mean for the high school class of 2011.³⁷ Because statewide averages include students enrolling at both two- and four-year institutions, AP STEM & English averages do the same.

Source: Mass Insight Education & Research Institute, Inc.

Note: Percentages are the simple mean for the high school class of 2011.³⁸ Because statewide averages include students enrolling at both two- and four-year institutions, AP STEM & English averages do the same.

Source: Mass Insight Education & Research Institute, Inc.

Graduation



Note: Percentages are the simple mean for the high school class of 2011.³⁹ Because statewide averages include students enrolling at both two- and four-year institutions, AP STEM & English averages do the same.

Source: Mass Insight Education & Research Institute, Inc.

AP STEM & English Participants Outperform Students Statewide on College Outcomes

For the class of 2011, the last year for which statewide data are publicly available, the college outcomes of AP STEM & English program participants are better than the college outcomes of Massachusetts students statewide. As illustrated in Figure 5, differences are particularly large among Black, Latino, and low-income students. For these groups, college enrollment, persistence, and graduation rates are 18.37 to 29.56 percentage points higher among AP STEM & English participants than students from similar racial, ethnic, and SES backgrounds statewide.

Synthesizing these findings with results for AP participation and performance suggest Mass Insight's AP STEM & English program is having its intended effect. Program participation is associated with significant improvements in AP participation and performance, which, in turn, predict college enrollment, participation, and performance and may help explain why program participants appear to be outperforming similar students statewide.

Modeling AP's Gap Closing Potential

Although AP STEM & English program participation is associated with large increases in exam taking and qualifying scores, particularly among Black, Latino, and low-income students, persistent racial, ethnic, and socioeconomic disparities in AP participation and performance exist among program participants. As illustrated in Table 1, low-income AP STEM & English participants of all racial and ethnic backgrounds take fewer AP exams and receive lower average exams scores than mid- to high-income students from the same racial or ethnic background. Racial and ethnic disparities exist as well. Whereas the average mid- to high-income Asian student takes 2.86 AP exams, the average low-income Latino student takes 2.00 AP exams. Similarly, whereas the average mid- to high-income White student receives an average AP exam score of 2.62, the average low-income Black student receives an average AP exam score of 1.80.

To determine whether equalizing AP participation and performance across groups could narrow racial, ethnic, and socioeconomic disparities in college outcomes, we use a three-step process. First, we

Table 1: AP Participation and Performance by Race, Ethnicity, and SES Among AP STEM & English Participants

	AP Participation				AP Performance			
	Low- income		Mid- to high-income		Low-income		Mid- to high-income	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
White	2.05	1.22	2.21	1.37	2.19	1.00	2.62	1.10
Black	2.01	1.17	2.29	1.29	1.80	0.84	1.98	0.93
Latino	2.00	1.18	2.08	1.26	1.81	0.87	2.15	1.03
Asian	2.61	1.50	2.86	1.57	2.20	1.09	2.51	1.17

Note: Averages and standard deviations are calculated using data from all White, Black, Latino, and Asian students who participated in the AP STEM & English program between 2008-2009 and 2012-2013 with valid SES and could be matched with National Student Clearinghouse data on college enrollment, persistence, and graduation. N = 15,918. Source: Mass Insight Education & Research Institute, Inc.

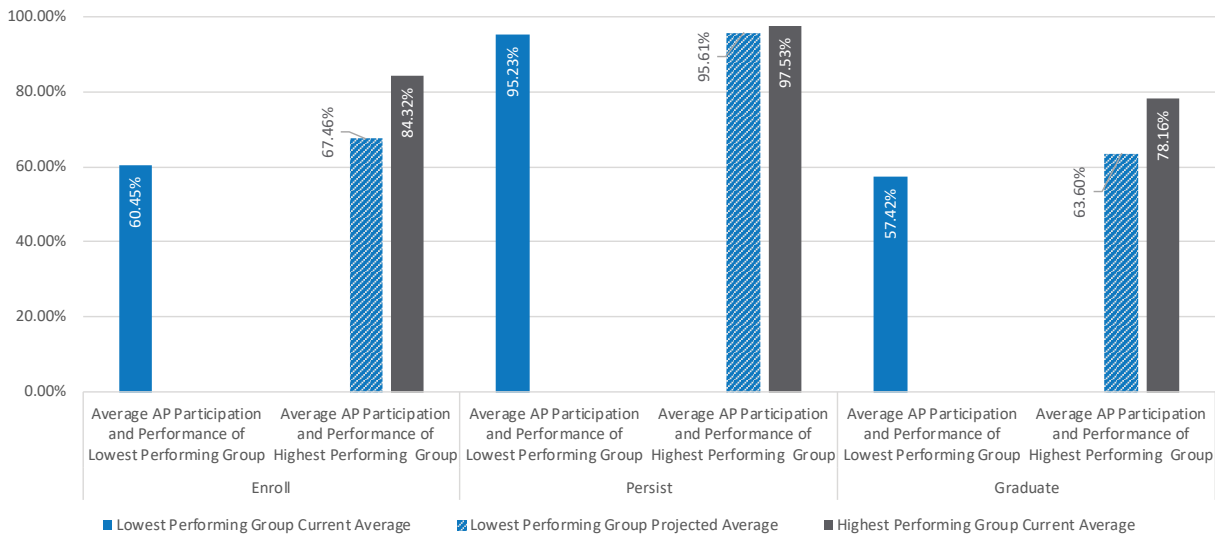
use multivariate logistic regression to identify the subgroups of program participants with the highest and lowest predicted probability of enrolling, persisting, and graduating from a four-year institution within 150% of normal time. Adding controls for AP participation and performance, we then estimate the predicted probability of each college outcome for the highest performing subgroup at that group’s average level of AP participation and performance. Finally, we estimate the predicted probability of each college outcome for the lowest performing subgroup at that group’s average level of AP participation and performance and the average level of AP participation and performance of the highest performing subgroup.

When the college outcomes of AP STEM & English participants are predicted based solely on race, ethnicity, and SES, mid- to high-income White

AP STEM & English participants have the highest predicted probability of enrolling, persisting, and graduating from a four-year institution within 150% of normal time—84.32%, 97.53%, and 78.16% respectively. Low-income Latino participants have the lowest predicted probability of enrolling in and graduating from a four-year institution within 150% of normal time (60.45% and 57.42% respectively), while low-income White students have the lowest predicted probability of persisting at a four-year institution for at least two years (95.23%).

Figure 6 illustrates how disparities in college enrollment, persistence, and graduation might change if the AP STEM & English program were able to ensure low-income Latino and White students took the same number of AP exams and received the same average score as mid- to high-income White students. Increasing the number of exams taken by

Figure 6: AP’s Gap Closing Potential



Note: Percentages are the predicted probability of each outcome calculated from multivariate logistic regression results presented in Appendix A, Table A2, models 2, 4, and 6. The lowest performing group is the racial or ethnic and socioeconomic group with the lowest predicted probability of each outcome when AP participation and performance are omitted from analyses. Models used to identify these groups are presented in Appendix A, Table A2, models 1, 3, and 5. For enrollment and graduation, the lowest performing group is Latino students from low-SES backgrounds. For persistence, the lowest performing group is White students from mid- to high-SES backgrounds. For all outcomes, White students from high-SES backgrounds serve as the highest performing group.
 Source: Mass Insight Education & Research Institute, Inc.

and the AP exam score of the average low-income Latino student from 2.00 to 2.21 and 1.81 to 2.62 respectively is predicted to close approximately 30% of the gap in college enrollment and graduation between low-income Latino and mid- to high-income White participants. Similarly, increasing the number of exams taken and the AP exam score of the average low-income White student from 2.05 to 2.21 and 2.19 to 2.62 respectively is predicted to close approximately 16.52% of the gap in college persistence, although this gap is just 2.30 percentage points at current AP participation and performance averages.

Together, these findings suggest that Mass Insight's AP STEM & English program can narrow disparities in college outcomes. But equalizing AP participation and performance across groups will not close these gaps entirely.

Holistic and Targeted Interventions May be Needed to Maximize the Gap Closing Potential of AP

To meaningfully impact persistent racial, ethnic, and SES disparities in college outcomes, interventions like the AP STEM & English program must be more narrowly targeted to Black, Latino, and low-income students. This may require working exclusively with schools that are predominately non-White and low-income or refining program activities to ensure Black, Latino, and low-income students receive additional supports during the summer or after school in order to improve rates of exam taking and qualifying scores. Since culturally relevant instruction has been associated with improvements in both academic achievement and engagement among students of color, efforts to target Black, Latino, and low-income students may also require improving the cultural relevance of the AP curriculum.⁴⁰

At the same time, schools may wish to embed interventions like the AP STEM & English program into more holistic efforts to improve the college readiness of Black, Latino, and low-income students. Among AP STEM & English participants, AP participation and performance explain just one to five percent of the variation in college matriculation, persistence, and performance. This is not surprising given that academic preparation, academic tenacity, and college knowledge are considered to be the strongest indicators of college readiness⁴¹ and AP participation and performance is only a partial measure of academic preparation. By addressing more than one indicator of college readiness simultaneously, schools that are able to embed interventions like the AP STEM & English program into more holistic efforts to improve the college readiness of Black, Latino, and low-income students may be able to impact racial, ethnic, and socioeconomic disparities in college outcomes in a way that schools focused solely on AP cannot.

A number of Mass Insight partners are beginning to put these recommendations into practice, thoughtfully integrating their efforts to improve AP participation and performance with a wide array of targeted and holistic programming. In the remainder of this section, we highlight a number of promising practices being implemented by current and former AP STEM & English partners:

The Calculus Project. Aiming to improve the number of Black, Latino, and low-income students who arrive in AP with the skills to succeed, one AP STEM & English school recently initiated a partnership with the Calculus Project. The Calculus Project aims to dramatically increase the number of students of color and low-income

students who complete AP calculus in high school. From the summer before 7th grade to the summer before 10th grade; Black, Latino and low-income students participate in a four-week summer program combining rigorous, engaging, and hands-on mathematics instruction with activities designed to increase students' growth mindset and ensure STEM careers are among the possible selves they consider. Program activities continue through the school year with afterschool study sessions and efforts to group cohorts of Calculus Project participants into the same mathematics class.⁴²

Pre-AP. A second partner will be implementing the College Board's pre-AP curriculum alongside the AP STEM & English program during the coming year. Unlike the Calculus Project, pre-AP is not targeted to one group of students or another, but administrators hope that by implementing the program in a school where over 90% of students are Black or Latino and nearly 75% are identified by the state as economically disadvantaged, they will be able to maximize AP's gap-closing potential. Pre-AP was designed to improve AP participation and performance by improving curricular alignment and instructional rigor. It is currently available in 12 content areas. The College Board provides frameworks, course guides, and curricular materials for 50% of course content along with professional development for participating teachers. In return, schools agree to implement "pre-AP for all" students and to allow the College Board to audit their classes, much like the organization audits AP courses in order to ensure that each course meets curricular and resource requirements.⁴³

OneGoal. To complement the AP STEM & English program's emphasis on academic preparation, a third partner has added OneGoal to the mix of college readiness interventions it offers to Black, Latino, and low-income students. Emphasizing academic tenacity and college knowledge, OneGoal aims to ensure college and postsecondary planning, preparation, and support are integral components of the high school experience for students in low-income communities. Participating students take a credit-bearing course during their junior and senior years with a culturally relevant curriculum designed to help them identify their vision of success, build resilient mindsets, and select and successfully enroll in a postsecondary institution. During their first year of college, participating students attend an orientation and receive one-on-one intensive coaching from the same OneGoal Program Director who supported them in high school.⁴⁴

Early College. Like AP, early college enables students to receive college credit for academic work completed in high school. One AP STEM & English partner is using AP seminar to integrate Early College and AP. An interdisciplinary course focused on critical thinking, collaboration, and academic research skills; AP seminar is now a foundational course for all students in the school's early college program.

By combining the AP STEM & English program with programs like the Calculus Project, pre-AP, OneGoal, and Early College, schools are finding ways to target Black, Latino, and low-income students more explicitly and embed AP into more holistic college readiness programs. Although schools are just beginning to try these interventions, it is expected

that they will help schools maximize the gap-closing potential of AP.

Conclusion

The U.S. economy requires a highly educated workforce, yet too few Black, Latino, and low-income students attend, persist, and graduate from college. Policy-makers and practitioners have argued that the College Board's AP program can help close racial, ethnic, and socioeconomic disparities in college readiness.⁴⁵ This is particularly important in the current moment, as the Coronavirus pandemic dramatically impacts teaching and learning and is expected to exacerbate racial, ethnic, and socioeconomic disparities.

Mass Insight's AP STEM & English program is a school-level intervention designed to improve college matriculation, persistence, and graduation, particularly among Black, Latino, and low-income students. Analyses presented in this Insights Brief suggest the program is having its intended effect. The program improves AP participation and performance, particularly among Black, Latino, and low-income students, and program participants, particularly Black, Latino, and low-income students, enroll, persist, and graduate from two- and four-year institutions at higher rates than the average Massachusetts high school senior.

Although the AP STEM & English program was not designed to close racial, ethnic, and socioeconomic gaps in AP participation and performance or college outcomes, program data offer a useful opportunity to evaluate AP's promise as a high-leverage strategy for closing persistent racial, ethnic, and socioeconomic disparities in college outcomes. Findings suggest that efforts to ensure Black, Latino, and low-income students participate in AP as often and perform as

well on AP exams as mid- to high-income White students may narrow disparities in college outcomes, but equalizing AP participation and performance will not close these gaps entirely. To maximize AP's gap-closing potential, practitioners should consider embedding AP into more holistic college readiness interventions and more explicitly target Black, Latino, and low-income students.

About The Author

Sarah Fierberg Phillips is Mass Insight's internal evaluator and leads studies examining the impact and effectiveness of our programs.

Before joining the Mass Insight team, Sarah worked as the Vice President of Research at Tripod Education Partners where she developed a host of survey offerings and conducted numerous studies on issues such as school climate, student engagement, teacher effectiveness, and racial disproportionality. Sarah's scholarship has been published in academic journals like *The Urban Review* and *Social Work Research*, and the social and emotional competency survey she developed for Tripod is featured in CASEL's well-respected SEL Assessment Guide. Sarah's research is informed by nearly a decade of experience as an educator and social worker. She was Service Director at City Year Rhode Island, a Community Organizing Liaison at the Jewish Council on Urban Affairs, and a founding staff member of Quilombo, one of Oakland, CA's first community schools. In addition, Sarah taught middle school in the Oakland Public Schools and high school in Alameda County's juvenile hall. She holds a doctorate in Social Policy from Brandeis University, a master's in Social Work from the University of Michigan, and B.A. in U.S. History from Brown University.

Table A1: Predicting College Outcomes by Race, Ethnicity, SES, AP Participation, and AP Performance

	Enroll	Persist	Graduate
Constant	2.01***	24.12*	2.01***
	0.09	3.00	0.11
Black	0.52***	0.89	0.53***
	(0.05)	(0.26)	(0.06)
Latino	0.47***	0.56*	0.45***
	(0.05)	(0.15)	(0.05)
Asian	0.72**	0.92	0.68***
	(0.09)	(0.29)	(0.08)
Low-income	0.44***	0.55***	0.53***
	(0.03)	(0.08)	(0.03)
Black X Low-income	2.79***	1.87	2.03***
	(0.36)	(0.71)	(0.28)
Latino X Low-income	1.86***	2.38*	2.09***
	(0.25)	(0.85)	(0.31)
Asian X Low-income	2.38***	2.44*	1.86***
	(0.36)	(1.03)	(0.27)
Average Score = 2	1.48***	1.22	1.29***
	(0.07)	(0.17)	(0.10)
Average Score = 3	2.04***	1.45*	1.72***
	(0.12)	(0.24)	(0.17)
Average Score = 4	2.39***	1.98**	1.69***
	(0.20)	(0.44)	(0.23)
Average Score = 5	2.42***	1.08	2.20**
	(0.34)	(0.31)	(0.54)
Two Exams	1.53***	1.24	0.79*
	(0.08)	(0.17)	(0.09)
Three + Exams Taken	2.63***	1.58**	1.01
	(0.14)	(0.22)	(0.11)
Average Score = 2 X Two Exams			1.58**
			(0.22)
Average Score = 2 X Three + Exams			1.31
			(0.18)
Average Score = 3 X Two Exams			1.52**
			(0.24)

Average Score = 3 X Three Exams			1.52**
			(0.23)
Average Score = 4 X Two Exams			1.85**
			(0.38)
Average Score = 4 X Three + Exams			1.83**
			(0.35)
Average Score = 5 X Two Exams			2.29*
			(0.82)
Average Score = 5 X Three = Exams			1.64
			(0.53)
N	15,114	12,353	12,353
Adjusted R ²	0.08	0.02	0.05

Note: The base case is a White student from a mid- to high-income background who took one AP exam and received an AP exam score of one. Coefficients are presented as odds ratios.

Standard errors are in parentheses.

* p < 0.05, ** p < 0.01, *** p < 0.001.

Source: Mass Insight Education & Research Institute, Inc.

Table A2: Predicting College Outcomes by Race, Ethnicity, SES, AP Participation, and AP Performance

	Enroll		Persist		Graduate	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	4.66**	1.16*	38.90***	19.56***	3.53***	1.34***
	(0.13)	(0.07)	(2.89)	(3.11)	(0.10)	(0.08)
Black	0.48***	0.52***	0.84	0.89	0.46***	0.53***
	(0.05)	(0.05)	(0.24)	(0.26)	(0.05)	(0.06)
Latino	0.43***	0.47***	0.53*	0.55*	0.41***	0.45***
	(0.04)	(0.05)	(0.14)	(0.15)	(0.05)	(0.05)
Asian	0.84	0.69**	0.99	0.90	0.70**	0.67***
	(0.10)	(0.08)	(0.31)	(0.29)	(0.08)	(0.08)
Low-income	0.40***	0.44***	0.52***	0.55***	0.48***	0.53***
	(0.02)	(0.03)	(0.08)	(0.08)	(0.03)	(0.03)
Black X Low-income	2.65***	2.77***	1.83	1.85	2.03***	2.02***
	(0.33)	(0.35)	(0.69)	(0.70)	(0.28)	(0.28)
Latino X Low-income	1.85***	1.84***	2.34*	2.36*	2.02***	2.06***
	(0.24)	(0.24)	(0.83)	(0.84)	(0.30)	(0.31)
Asian X Low-income	2.29***	2.41***	2.42*	2.48*	1.82***	1.85***
	(0.34)	(0.37)	(1.02)	(1.04)	(0.26)	(0.27)

Exams Taken		1.43***		1.16**		1.09***
		(0.03)		(0.05)		(0.02)
Average Score		1.33***		1.16**		1.34***
		(0.03)		(0.07)		(0.03)
N	15,114	15,114	12,353	12,353	12,353	12,353
Adjusted R²	0.03	0.08	0.01	0.02	0.02	0.04

Note: The base case is a White student from a mid- to high-income background. Models 2, 4, and 6 differ from models presented in Appendix A, Table A1 because they treat exams taken and average score as continuous variables in order to generate the predicted probability of each outcome at various subgroup means and, in Model 6, do not include interaction terms to capture variation in the relationship between graduation and AP exams taken by AP exam score. Coefficients are presented as odds ratios. Standard errors are in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Source: Mass Insight Education & Research Institute, Inc.

Endnotes

¹Anthony P. Carnevale, Tamara Jayasundera, and Artem Gulish, "America's Divided Recovery: College Haves and Have-Nots" (Washington, DC: Georgetown University, Center on Education and the Workforce, 2016), <https://1gyhoq479ufd3yna29x7ubjn-wpengine.netdna-ssl.com/wp-content/uploads/Americas-Divided-Recovery-web.pdf>.

²U.S. Bureau of Labor Statistics, "Employment, Wages, and Projected Change in Employment by Typical Entry-Level Education" (Washington, DC: Author, April 15, 2020), <https://www.bls.gov/emp/tables/education-summary.htm>.

³Megan Kuhfeld et al., "Projecting the Potential Impacts of COVID-18 School Closures on Academic Achievement" (Providence, RI: Annenberg Institute at Brown University, 2020), <https://www.edworkingpapers.com/sites/default/files/ai20-226-v2.pdf>.

⁴Kuhfeld et al.

⁵Emma Dorn, Jimmy Sarakatsannis, and Ellen Viruleg, "COVID-19 and Student Learning in the United States: The Hurt Could Last a Lifetime" (New York, New York: McKinsey & Company, June 1, 2020), <https://www.mckinsey.com/industries/public-sector/our-insights/covid-19-and-student-learning-in-the-united-states-the-hurt-could-last-a-lifetime>.

⁶David P. Hale, "The Lowest Quartile African Americans Taking Advanced Placement Language and Literature," *The Clearing House: A Journal of Educational Strategies, Issues and Ideas* 80, no. 3 (January 1, 2007): 123–25, <https://doi.org/10.3200/TCHS.80.3.123-125>; Jonathan H. Ohrt, Glenn W. Lambie, and Kara P. Ieva, "Supporting Latino and African-American Students in Advanced Placement Courses: A School Counseling Program's Approach," *Professional School Counseling* 13, no. 1 (October 1, 2009): 2156759X0901300104, <https://doi.org/10.1177/2156759X0901300104>; Jocelyn DeVance

Taliaferro and Jessica T. DeCuir-Gunby, "African American Educators' Perspectives on the Advanced Placement Opportunity Gap," *The Urban Review* 40, no. 2 (June 1, 2008): 164–85, <https://doi.org/10.1007/s11256-007-0066-6>; U.S. Department of Education, "A Forum to Expand Advanced Placement Opportunities: Increasing Access and Improving Preparation in High Schools. [Transcript of Proceedings]." (Washington, DC: Author, 2000).

⁷U.S. Department of Education, "A Forum to Expand Advanced Placement Opportunities: Increasing Access and Improving Preparation in High Schools. [Transcript of Proceedings]." 12.

⁸K. Klopfenstein, "Does the Advanced Placement Program Save Taxpayers Money? The Effect of AP Participation on Time to College Graduation.," in *AP: A Critical Examination of the Advanced Placement Program*, ed. P.M. Sadler et al. (Cambridge, MA: Harvard Education Press, 2010), 189–218.

⁹Phillip L. Ackerman, Ruth Kanfer, and Charles Calderwood, "High School Advanced Placement and Student Performance in College: STEM Majors, Non-STEM Majors, and Gender Differences.," *Teachers College Record*, 2013; Saul Geiser and Veronica Santelices, "The Role of Advanced Placement and Honors Courses in College Admissions," *Expanding Opportunity in Higher Education: Leveraging Promise* 75114 (2006); Klopfenstein, "Does the Advanced Placement Program Save Taxpayers Money? The Effect of AP Participation on Time to College Graduation.," K. Klopfenstein and M. Thomas, "The Link between Advanced Placement Experience and Early College Success," *Southern Economic Journal*, 2009, 873–91; Sunel Kolluri, "Advanced Placement: The Dual Challenge of Equal Access and Effectiveness," *Review of Educational Research* 88, no. 5 (2018): 671–711.

¹⁰Cecilia Speroni, "Determinants of Students' Success: The Role of Advancement Placement and Dual Enrollment Programs" (New York: National Center for Postsecondary Research,

November 2011).

¹¹Krista D. Mattern, Emily J. Shaw, and Xinhui Xiong, "The Relationship between AP® Exam Performance and College Outcomes. Research Report No. 2009-4." (New York: The College Board, 2009).

¹²Mattern, Shaw, and Xiong; Rick Morgan and John Klaric, "AP® Students in College: An Analysis of Five-Year Academic Careers. Research Report No. 2007-4.," College Board, 2007; P. M. Sadler and G. Sonnert, "High School Advanced Placement and Success in College Coursework in the Sciences," AP: A Critical Examination of the Advanced Placement Program, 2010, 119–37.

¹³Ackerman, Kanfer, and Calderwood, "High School Advanced Placement and Student Performance in College: STEM Majors, Non-STEM Majors, and Gender Differences.," Klopfenstein, "Does the Advanced Placement Program Save Taxpayers Money? The Effect of AP Participation on Time to College Graduation.," Morgan and Klaric, "AP® Students in College: An Analysis of Five-Year Academic Careers. Research Report No. 2007-4.," Speroni, "Determinants of Students' Success: The Role of Advancement Placement and Dual Enrollment Programs."

¹⁴The College Board, "The 10th Annual AP Report to the Nation" (New York: Author, February 11, 2014).

¹⁵The College Board, "District Leadership Playbook: Expanding Access to Advanced Placement for Students of Color" (New York: Author, 2015).

¹⁶Ronald F. Ferguson, *Towards Excellence with Equity: An Emerging Vision for Closing the Achievement Gap* (Cambridge, MA: Harvard University Press, 2007); Sean F. Reardon, "The Widening Academic Achievement Gap between the Rich and the Poor: New Evidence and Possible Explanations," in *Whither Opportunity: Rising Inequality, Schools, and Children's Life Chances*, ed. Greg J. Duncan and Richard Murnane (New York: Russell Sage foundation, 2011), 91–116.

¹⁷Kayla Patrick, Allison Socol, and Ivy Morgan, "Inequities in Advanced Coursework: What's Driving Them and What Leaders Can Do.," Education Trust, 2020.

¹⁸"Raising the Bar: Curricular Intensity and Academic Performance," *Educational Evaluation and Policy Analysis* 30, no. 1 (2008): 51–71.

¹⁹Massachusetts Department of Elementary and Secondary Education, "Massachusetts Students Lead Nation in Advanced Placement Success for Fourth Year [Press Release]" (Maldne, MA: Author, February 6, 2020); Michelle Williams, "Massachusetts Leads Nation in Highest Scores on Advanced Placement Exams," *Masslive*, February 21, 2018, https://www.masslive.com/news/2018/02/massachusetts_leads_nation_in.html.

²⁰Ackerman, Kanfer, and Calderwood, "High School

Advanced Placement and Student Performance in College: STEM Majors, Non-STEM Majors, and Gender Differences.," Geiser and Santelices, "The Role of Advanced Placement and Honors Courses in College Admissions"; Klopfenstein, "Does the Advanced Placement Program Save Taxpayers Money? The Effect of AP Participation on Time to College Graduation.," Klopfenstein and Thomas, "The Link between Advanced Placement Experience and Early College Success"; Kolluri, "Advanced Placement: The Dual Challenge of Equal Access and Effectiveness"; Mattern, Shaw, and Xiong, "The Relationship between AP® Exam Performance and College Outcomes. Research Report No. 2009-4.," Morgan and Klaric, "AP® Students in College: An Analysis of Five-Year Academic Careers. Research Report No. 2007-4.," Sadler and Sonnert, "High School Advanced Placement and Success in College Coursework in the Sciences"; Speroni, "Determinants of Students' Success: The Role of Advancement Placement and Dual Enrollment Programs."

²¹Janet H. Chrispeels, J. H. Brown, and S. Castillo, "School Leadership Teams: Factors That Influence Their Development and Effectiveness," *Advances in Research and Theories of School Management and Educational Policy* 4 (2000): 39–73; Lorna Earl and Steven Katz, "Leading Schools in a Data-Rich World," in *Second International Handbook of Educational Leadership and Administration*, ed. K. Leithwood and P. Hallinger (Dordrecht, Netherlands: Kluwer Academic, 2002), 1003–22.

²²The College Board, "District Leadership Playbook: Expanding Access to Advanced Placement for Students of Color."

²³William R. Penuel et al., "What Makes Professional Development Effective? Strategies That Foster Curriculum Implementation," *American Educational Research Journal* 44, no. 4 (2007): 921–58.

²⁴"District Leadership Playbook: Expanding Access to Advanced Placement for Students of Color."

²⁵L. Darling-Hammond et al., "Effective Teacher Professional Development" (Washington, DC: Learning Policy Institute, June 2017); Michael S. Garet et al., "What Makes Professional Development Effective? Results from a National Sample of Teachers," *American Educational Research Journal* 38, no. 4 (2001): 915–45; Penuel et al., "What Makes Professional Development Effective? Strategies That Foster Curriculum Implementation."

²⁶Heather C. Hill, Mary Beisiegel, and Robin Jacob, "Professional Development Research: Consensus, Crossroads, and Challenges," *Educational Researcher* 42, no. 9 (2013): 476–87.

²⁷Jim Knight, "Instructional Coaching.," *School Administrator* 63, no. 4 (2006): 36; Barbara Neufeld and Dana Roper, "Off to a Good Start: Year I of Collaborative Coaching and Learning in the Effective Practice Schools." (Boston: Education Matters,

2002); James E. Taylor, "Instructional Coaching: The State of the Art," in *Effective Teacher Leadership: Using Research to Inform and Reform*, ed. M.M. Mangin and R. Stoelinga (New York: Teacher College Press, 2008), 10–35.

²⁸Matthew A. Kraft, David Blazar, and Dylan Hogan, "The Effect of Teacher Coaching on Instruction and Achievement: A Meta-Analysis of the Causal Evidence," *Review of Educational Research* 88, no. 4 (2018): 547–88; Wendy M. Reinke, Teri Lewis-Palmer, and Kenneth Merrell, "The Classroom Check-up: A Classwide Teacher Consultation Model for Increasing Praise and Decreasing Disruptive Behavior," *School Psychology Review* 37, no. 3 (2008): 315.

²⁹Bruce Joyce and Beverly Showers, "Student Achievement through Staff Development White Plains," NY: Longman, 1995; Kathryn Kinnucan-Welsch, Catherine A. Rosemary, and Patricia R. Grogan, "Accountability by Design in Literacy Professional Development," *The Reading Teacher* 59, no. 5 (2006): 426–35.

³⁰Raj Chetty, John N. Friedman, and Jonah E. Rockoff, "Measuring the Impacts of Teachers II: Teacher Value-Added and Student Outcomes in Adulthood," *American Economic Review* 104, no. 9 (2014): 2633–79; Steven G. Rivkin, Eric A. Hanushek, and John F. Kain, "Teachers, Schools, and Academic Achievement," *Econometrica* 73, no. 2 (2005): 417–58; Jonah E. Rockoff, "The Impact of Individual Teachers on Student Achievement: Evidence from Panel Data," *American Economic Review* 94, no. 2 (2004): 247–52.

³¹Maria A. Cattaneo, Chantal Oggenfuss, and Stefan C. Wolter, "The More, the Better? The Impact of Instructional Time on Student Performance," *Discussion Paper Series* (Bonn, Germany: Institute for the Study of Labor, March 2016); Will Dobbie and Roland G. Fryer Jr, "Getting beneath the Veil of Effective Schools: Evidence from New York City," *American Economic Journal: Applied Economics* 5, no. 4 (2013): 28–60; John Jerrim et al., "What Happens When Econometrics and Psychometrics Collide? An Example Using the PISA Data," *Economics of Education Review* 61 (2017): 51–58; Victor Lavy, "Do Differences in Schools' Instruction Time Explain International Achievement Gaps? Evidence from Developed and Developing Countries," *The Economic Journal* 125, no. 588 (2015): F397–424; Steven G. Rivkin and Jeffrey C. Schiman, "Instruction Time, Classroom Quality, and Academic Achievement," *The Economic Journal* 125, no. 588 (2015): F425–48.

³²Chetty, Friedman, and Rockoff, "Measuring the Impacts of Teachers II: Teacher Value-Added and Student Outcomes in Adulthood"; Rivkin, Hanushek, and Kain, "Teachers, Schools, and Academic Achievement"; Rockoff, "The Impact of Individual Teachers on Student Achievement: Evidence from Panel Data."

³³James A. Kulik, Chen-Lin C. Kulik, and Robert L. Bangert, "Effects of Practice on Aptitude and Achievement

Test Scores," *American Educational Research Journal* 21, no. 2 (January 1, 1984): 435–47, <https://doi.org/10.3102/00028312021002435>; Katherine A. Rawson and John Dunlosky, "When Is Practice Testing Most Effective for Improving the Durability and Efficiency of Student Learning?," *Educational Psychology Review* 24, no. 3 (2012): 419–35.

³⁴Dong Wook Jeong, "Student Participation and Performance on Advanced Placement Exams: Do State-Sponsored Incentives Make a Difference?," *Educational Evaluation and Policy Analysis* 31, no. 4 (2009): 346–66.

³⁵Mass Insight Education & Research, "Our Competitive Advantage: Developing a Diverse STEM Talent Pool" (Boston, MA, September 2019).

³⁶Mass Insight Education & Research.Kolluri, "Advanced Placement: The Dual Challenge of Equal Access and Effectiveness."

³⁷MA Department of Elementary and Secondary Education, "DART Detail: Success after High School" (Malden, MA: Author, November 2019), <http://www.doe.mass.edu/dart/>.

³⁸MA Department of Elementary and Secondary Education.

³⁹MA Department of Elementary and Secondary Education.

⁴⁰Gloria Ladson-Billings, *The Dream-Keepers: Successful Teachers of African American Children* (John Wiley & Sons, 2009).

⁴¹Elaine M. Allensworth, Jenny Nagaoka, and David W. Johnson, "High School Graduation and College Readiness Indicator Systems: What We Know, What We Need to Know" (Chicago, IL: University of Chicago Consortium on School Research, 2018)

⁴²Cambridge Education, "The Calculus Project: Creating a New Path to Success in Advanced Mathematics" (Westwood, MA: Author, Undated), <https://www.camb-ed.com/americas/the-calculus-project>.

⁴³The College Board, "Discover Pre-AP" (New York, New York, 2020), <https://pre-ap.collegeboard.org>.

⁴⁴OneGoal, "Our Model: Our Approach Differentiates Us" (New York, New York: Author, 2020), <https://www.onegoalgraduation.org/our-model/>.

⁴⁵Hale, "The Lowest Quartile African Americans Taking Advanced Placement Language and Literature"; Ohrt, Lambie, and Ieva, "Supporting Latino and African-American Students in Advanced Placement Courses: A School Counseling Program's Approach"; Taliaferro and DeCuir-Gunby, "African American Educators' Perspectives on the Advanced Placement Opportunity Gap"; U.S. Department of Education, "A Forum to Expand Advanced Placement Opportunities: Increasing Access and Improving Preparation in High Schools. [Transcript of Proceedings]."



**69 Canal Street, 3rd floor
Boston, MA 02114
857-315-5243**

massinsight.org

[@MassInsightEdu](https://twitter.com/MassInsightEdu)

facebook.com/mathscience