2016–2017 Implementation Evaluation of the National Math and Science Initiative's College Readiness Program

NMSI/20160003/Year 1/Deliverable - March 2018

Julia Phelan, Jeffrey Egger, Joanne K. Michiuye, Eunhee Keum, Kilchan Choi,
Gregory K. W. K. Chung, and Eva L. Baker
CRESST/University of California, Los Angeles

National Center for Research on Evaluation,
Standards, and Student Testing (CRESST)
Center for the Study of Evaluation (CSE)
Graduate School of Education & Information Studies
University of California, Los Angeles
300 Charles E. Young Drive North
GSE&IS Bldg., Box 951522
Los Angeles, CA 90095-1522
(310) 206-1532

The work reported herein was supported by a subgrant from the National Math and Science Initiative, award number 20160003, to the National Center for Research on Evaluation, Standards, and Student Testing (CRESST). The work was made possible by funding from the U.S. Department of Education to the National Math and Science Initiative.

The findings and opinions expressed in this report are those of the authors and do not necessarily reflect the positions or policies of the National Math and Science Initiative or the U.S. Department of Education.

TABLE OF CONTENTS

Abstract 1
I. Introduction 2
II. Program Description 3
III. Research Questions 5
IV. Results for Impact Study 7
V. Results for Implementation Evaluation 19
VI. Summary 47
VII. References 52
Appendix A: Connection to Logic Model 54
Appendix B: Teacher Survey Measure 57
Appendix C: Administrator Survey Measure 72
Appendix D: Student Survey Measure 80
Appendix E: Teacher Interview Questions 92
Appendix F: Administrator Interview Questions 94
Appendix G: Student Survey Data 96
Appendix H: Distribution of Teacher Survey Respondents by State, District, and School 97

2016–2017 IMPLEMENTATION EVALUATION OF THE NATIONAL MATH AND SCIENCE INITIATIVE'S COLLEGE READINESS PROGRAM

Julia Phelan, Jeffrey Egger, Joanne K. Michiuye, Eunhee Keum, Kilchan Choi,
Gregory K. W. K. Chung, and Eva L. Baker
CRESST/University of California, Los Angeles

Abstract

The National Math + Science Initiative's (NMSI's) College Readiness Program (CRP) is an established program whose goal is to promote science, technology, engineering, and mathematics education in high schools to improve students' readiness for college. The program provides teacher, student, and school supports to promote high school students' success in mathematics, science, and English Advanced Placement (AP) courses, with a focus on students who are traditionally underrepresented in the targeted AP courses.

Through a scale-up grant awarded to NMSI by the Investing in Innovation (i3) program, the CRP was implemented in 28 schools in the 2016–2017 school year. CRESST conducted an independent evaluation of the impact of the CRP on students' AP outcomes using a randomized cluster trial with 28 CRP schools and 24 control schools in 10 states. The evaluation of the CRP consisted of two parts: (1) assessment of the program's impact on selected student AP exam outcomes and (2) assessment of the fidelity of implementation of the CRP.

Program impact was evaluated using a 2-level hierarchical generalized linear model (HGLM) with students nested within schools The descriptive statistics showed that a higher percetange of students in the treatment schools took at least one AP course (30.7%) compared to those in the control schools (26.4%) by approximately 4.3%, however the difference was not statistically significant. In addition, students in the treatment schools were not more likely to achieve a score of 3 or higher, when compared to the delayed treatment schools. We further examined the effectiveness of the CRP using the prior year's school-level performance on the AP exam as a covariate. As with the above findings, the results indicated the probability of a student taking at least one AP course or scoring 3 or higher on at least one AP exam is not statistically different between students in the treatment schools and those in the control treatment schools.

Fidelity of implementation was evaluated using a fidelity matrix approach (required as part of the evaluation of the i3 program), which showed that not all elements of the program were implemented with high fidelity. Overall results, however, indicated that 23 schools out of 28 treatment schools (82.1%) achieved 80% or better implementation fidelity, for an average fidelity score of 89.5%. Seven schools achieved a perfect 100% fidelity score. Looking at the different indicator groups (school, teacher and student),

we found that all school support measures across all schools were implemented with fidelity. In over 80% of schools, not all teachers fulfilled their requirements for attending all training sessions, and so this component was not implemented with fidelity. Stipends and teacher awards were paid as expected as were student award payments.

Teacher survey data indicated that teachers found the training and professional development activities provided by the CRP to be the most benefical program supports relating to helping increase student achievement in AP courses. Teacher incentives were chosen as the least important program component relating to increasing student performance by 16% of teachers and student incentives by 12% of teachers. Teachers did, however, view the student incentives as an important program component to encourage enrollment in AP courses. Likewise, students rated the financial incentives on average as somewhat important in encouraging them to participate in AP courses.

I. Introduction

Proficiency in math and science is crucial to our country's capacity for innovation and future economic growth, yet a growing number of students lack foundational knowledge and skills in these subjects. Performance in math and science of U.S. college students is also below that of their peers in many other nations (Chen, 2013; Fleischman, Hopstock, Pelczar, & Shelley, 2010). In 2011, for example, roughly one third of U.S. bachelor's degrees were awarded in science and engineering fields, compared to 60% in Japan and 50% in China (National Science Board, 2014). Indeed, it is estimated that in 2016, only around 41% of U.S. high school graduates were ready for college-level math, and only 36% ready for college-level science (ACT, Inc., 2016). The most recent Programme for International Student Assessment (PISA) results, from 2015, found the U.S. placed 38th of 71 countries in math and 34th in science (Pew Research Center, 2017). The necessity for an increased focus on math and science specifically is based on years of research which shows fewer students are entering math- and science-related career fields (National Science Board, 2010).

These issues are even more pronounced for high-need and traditionally underserved students who may face hurdles because of policies and mindsets that limit their ability to access rigorous coursework. Data from the National Science Foundation (NSF) found that 27% of ninth graders in the lowest socioeconomic status category were not enrolled in any science courses, compared with 11% of students in the highest income category. These differences in access and opportunity can lead to achievement gaps that continue through college and beyond. The gap between White students' six-year college graduation rates and their African American peers is around 22%, and the gap between White students and their Hispanic peers is 10% (Kena et al., 2014).

The National Math and Science Initiative (NMSI) was formed to address the declining number of students prepared to take rigorous college courses in math and science and equipped for careers in those fields. The College Readiness Program (CRP) was created to raise the academic bar in public schools by demonstrating that more students, especially high-need students, can master rigorous Advanced Placement (AP®) coursework, with a particular emphasis on math and science. The CRP addresses the need to improve STEM education, increase academic intensity, and improve student achievement in order to decrease the college readiness gap, especially among traditionally underrepresented and high-need students.

Program supports include teacher training; incentive payments to teachers, administrators, and students (tied to AP performance); student study sessions; and provision of equipment and supplies. Over a three-year period, the CRP supports high schools, focusing on school reform, changing school culture, building a pipeline of students who enter high school ready for more rigorous coursework, and working within the existing school framework (as opposed to creating new schools).

This project builds on several prior evaluations, most recently the success of NMSI's 2011 validation i3 grant which focused on schools in Colorado and Indiana. This study aimed to explore the impact of NMSI's CRP on selected student outcomes and evaluate the fidelity of implementation of the program in 10 states. This report presents findings from the evaluation of the impact of the CRP as well as findings from the fidelity of implementation study based on the fidelity matrix approach.

In the next section we provide an overview of the CRP and key components which were the focus of the analysis of the fidelity of program implementation in this evaluation.

II. Program Description

A. CRP Logic Model

The CRP logic model (Figure 1) presents the key components of the intervention: program management, teacher support, student support, and financial awards. For teachers, the program offers (a) course-specific training, (b) access to expert mentors, and (c) online curricular resources. For students, the program offers (a) study sessions focused on student support, (b) exam fee subsidies, and (c) access to classroom materials needed to support rigorous coursework. For schools, the program offers (a) an annual review of program components and compliance to ensure maximum program effectiveness, and support of academic and program experts; (b) mutually agreed upon expectations for program participation and support; and (c) performance goals for teachers, students, and schools. At all levels there are also financial incentives associated with participating and succeeding in AP courses/exams.

Teacher participation in professional development and mentoring, their access to rigorous materials and resources, and the use of incentives are designed to drive increased knowledge and use of pedagogical strategies as well as increased content knowledge and increased effectiveness in the classroom. Those intermediate outcomes should drive longer term outcomes such as increases in AP course enrollment, increases in the percentage of qualifying AP scores, and an increased number of teachers qualified to teach AP courses.

For students, additional time on task, access to rigorous materials, resources, homework help, awards for performance, and exposure to highly trained teachers are all designed to increase student engagement, preparation, and motivation to perform well. These intermediate outcomes should then influence AP enrollment and percentage of qualifying AP scores. Furthermore, more students at a school obtaining qualifying scores and having positive experiences in AP courses should positively impact the number of students persisting in STEM courses.

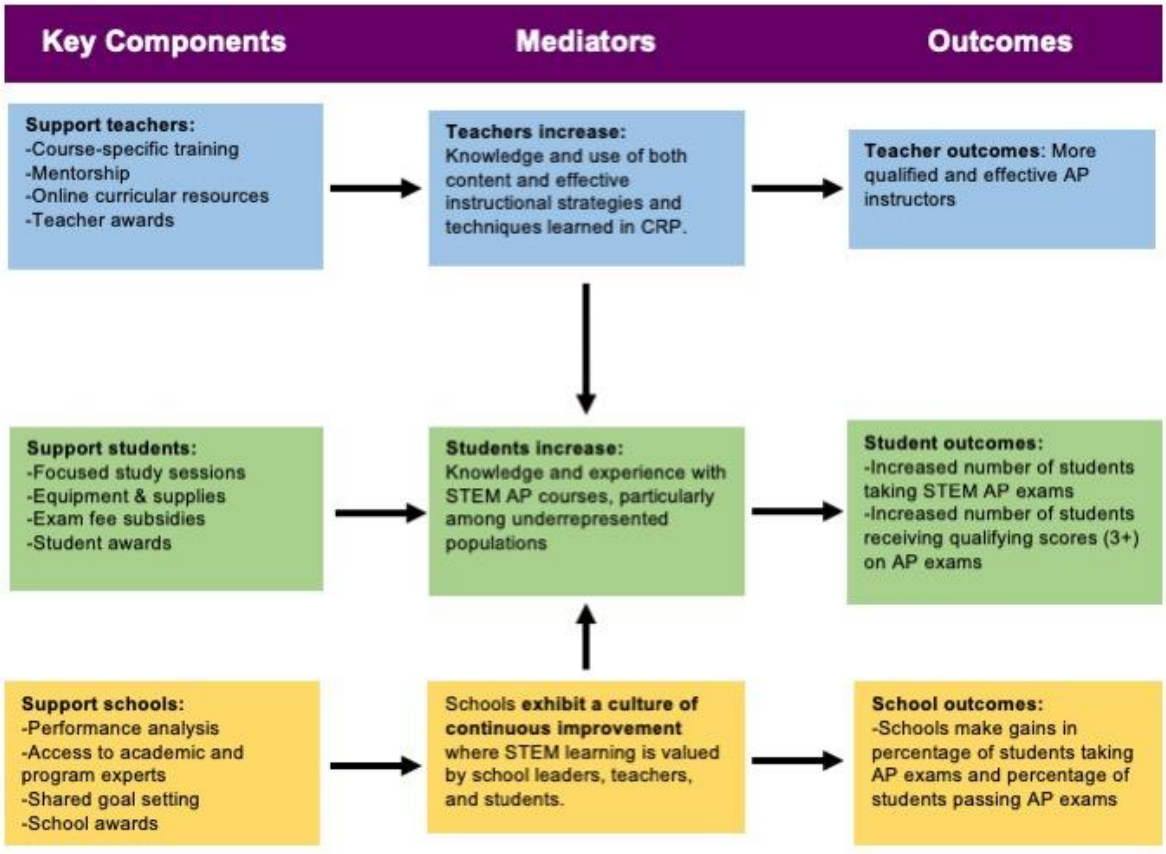

Figure 1. Logic model supporting NMSI's College Readiness Program.

B. Program Structure

The program begins with an intensive summer teacher training for AP teachers. Since teacher training has limited effectiveness without additional support, NMSI AP teachers are also given access to an expert mentor to provide coaching, support, and assistance throughout the year. Teachers must apply for a mentor and once they have done so are assigned an online mentor with whom they interact on a weekly basis. Some mentors visit teachers' classrooms during the academic year to provide opportunities for CRP teachers to observe a more experienced "master teacher." CRP schools also have use of in-depth, online content for teachers and students to maximize their success.

The next component of the program provides more time on task for students. Students attend three 6-hour Saturday study sessions taught by a master AP teacher—time that equates to three extra weeks of AP class time. The study sessions provide professional development and collaboration opportunities; teachers and students from multiple schools participate and teachers can see how expert teachers address difficult parts of AP courses. For the three years of NMSI program implementation, teachers continue to receive progressively more rigorous training and lessons; teachers and administrators continue to push further toward increasingly challenging goals; and both students and teachers receive nominal monetary awards for success. NMSI staff work with teachers and administrators throughout implementation to track progress toward their goals and troubleshoot where needed.

III. Research Questions

The evaluation of the CRP under the i3 scale-up grant consisted of two parts: (1) assessment of the program's impact on selected student AP exam outcomes and (2) assessment of the fidelity of implementation of the CRP. The evaluation included 28 treatment and 24 control schools in 10 states where CRP was being implemented as part of the i3 scale-up grant.

Research questions for the evaluation were as follows:

1. What was the impact of the CRP on the likelihood that students took STEM-related AP courses?
2. What was the impact of the CRP on the likelihood that students achieved a qualifying score of 3 or higher on STEM-related AP exams?
3. To what extent were each of the key components of the CRP implemented with fidelity?
4. What were the facilitators and barriers to implementation?

A. Study Design and Sample

To address our research questions, we conducted a randomized cluster trial (RCT). Schools were randomly assigned either to treatment or control conditions and teachers within schools following the school assignment. Schools were randomly assigned to experimental conditions prior to program implementation. In the year on which this report is based (2016–2017), there were two groups of schools: an initial treatment group and a delayed treatment group (i.e., control schools in year 2016–2017). The delayed treatment group comprised schools in which implementation of CRP involved a one-year delay.

For the RCT in year 2016–2017, comparisons were made between the treatment schools and the delayed treatment schools as control schools. For 2017–2018, both initial treatment schools and delayed treatment schools will constitute the treatment group and comparison schools will be selected using propensity score matching techniques.

For the RCT, we first sampled 10 different regions (CA, GA, IL, LA, MI, MO, ND, OH, PA, and TX). These regions represented all locations where the CRP was being implemented in this scale-up grant. Within eight regions/states, one target school district was recruited, while two regions/states recruited more than one district: three districts for PA, and two for ND. The target districts included those with (1) a high concentration of socioeconomically disadvantaged students, and (2) high schools which have provided very few or no AP courses in the past.

Within each region and district, schools were invited to apply for participation. Those schools that completed the application were randomized to treatment or delayed treatment conditions within district and region, as shown in Table 1. Fifty-two schools were randomly assigned to either treatment or delayed treatment groups in Year 1. In Year 1, delayed treatment schools conducted business-as-usual (BAU). That is, they utilized standard methods of providing AP courses, which typically do not include the supports NMSI provides to teachers and students, including incentives for successful completion of AP tests.

Note randomization within district and region led to unequal numbers of schools in treatment and control conditions in some regions. In ND, we randomly assigned two schools to the treatment condition and one school to the delayed treatment condition in one district, and in the second district, one treatment and one delayed treatment school were assigned. In PA, there were originally 10 schools from 10 different school districts while we were conducting random assignment in March 2016. We divided 10 schools into two regions (eight for one region and two for the other region) in a geographically clustered fashion. Within each region, we performed random assignment, four schools for treatment and four schools for the delayed treatment condition in the first region and one for treatment and one for the delayed treatment condition in

the second region. However, one treatment school in the first region and one treatment school in the second region did not participate in this study, and it resulted in three treatment schools and five delayed treatment schools participating in PA. Later, three delayed treatment schools withdrew, which resulted in three treatment schools and two delayed treatment schools. Also note that these regions represent blocks which were taken into account in our impact model. Table 1 below shows the numbers of regions, schools, and students in this study.

Table 1

Sampling Plan for RCT

	School		Students (11th and 12th graders)	
Region	**Treatment**	**Delayed treatment**	**Treatment**	**Delayed treatment**
CA	2	1	1,097	689
GA	2	2	826	1,483
IL	3	2	829	587
LA	1	1	523	263
MI	2	1	1,618	959
MO	3	3	791	376
ND	3	2	1,648	1,260
OH	4	4	888	644
PA	3	2	1,593	890
TX	5	3	2,553	1,770
Total	28	21	12,366	8,921

IV. Results for Impact Study

A. Descriptive Statistics of 2017 AP Course Taking and Exam Data

We first provide descriptive statistics of the AP course taking and exam data. These descriptive statistics present the percentage of each outcome of interest by treatment and delayed treatment schools (see Table 2 through Table 7). Note that the data on AP courses taken by students as well as AP exam data are based only on the enrolled 11^{th} and 12^{th} grade students.

Students in the treatment schools were more likely to take an AP course than those in the delayed treatment schools. In the treatment schools 30.7% of the total enrolled 11^{th} and 12^{th} grade students took at least one AP course, compared to 26.4% of students in the delayed treatment schools (see Table 2). However, the percentage of students who scored 3 or higher on at least one AP exam was higher in the delayed treatment group (9.4% of enrolled students and

35.7% of the students who took an AP course) than in the treatment group (7.3% and 23.6% respectively). This suggests that students in the treatment schools were slightly less likely to score 3 or higher on an AP exam than those in the delayed treatment schools.

Table 2

Outcomes for Students Taking (or Scoring 3+) on at Least One AP Course

	Students taking AP course		**Students with score of 3+**		
Group	***n***	**%**	***n***	**%**	**As % of course takers**
Treatment	3794	30.7%	897	7.3%	23.6%
Delayed treatment	2353	26.4%	840	9.4%	35.7%
All schools	6147	28.9%	1737	8.2%	28.3%

Table 3 shows that the percentage of students who took at least one math AP course was slightly higher in the treatment schools (7.9%) than the delayed treatment schools (7.6%), whereas the percentage of students who scored 3 or higher on at least one math AP exam was higher in the delayed treatment schools (3.1% of all enrolled 11th and 12th grade students and 41.4% of the students who took any AP math course) than the percentage of students in the treatment schools (2.3%; 29.4%).

Table 3

Outcome for Students Taking (or Scoring 3+) on at Least One Math AP Course

	Students taking AP course		**Students with score of 3+**		
Group	***n***	**%**	***n***	**%**	**As % of course takers**
Treatment	975	7.9%	287	2.3%	29.4%
Delayed treatment	674	7.6%	279	3.1%	41.4%
All schools	1649	7.7%	566	2.7%	34.3%

For science (see Table 4), the percentage of students who took at least one science AP course was higher in the treatment schools (13.7%) than the delayed treatment schools (11.2%). In contrast, the delayed treatment schools showed a higher percentage of students who scored 3 or higher on at least one AP science exam (2.7% of all enrolled students and 23.9% of the students who took any AP science course) than the treatment schools (2.2%; 15.9%).

Table 4

Outcomes for Students Taking (or Scoring 3+) on at Least One AP Science Course

	Students taking AP course		Students with score of 3+		
Group	***n***	**%**	***n***	**%**	**As % of course takers**
Treatment	1697	13.7%	269	2.2%	15.9%
Delayed treatment	996	11.2%	238	2.7%	23.9%
All schools	2693	12.7%	507	2.4%	18.8%

Similar results are shown in Table 5. The percentage of students who took at least one AP English course was higher in the treatment schools (18%) than the delayed treatment schools (13.6%). But the percentage of students who scored 3 or higher on at least one AP English exam was higher in the delayed treatment schools (5.1% of all enrolled students and 37.3% of the students who took any AP English course) than the percentage of students in the treatment schools (3.9%; 21.6%).

Table 5

Outcomes for Students Taking (or Scoring 3+) on at Least One English AP Course

	Students taking AP course		Students with score of 3+		
Group	***n***	**%**	***n***	**%**	**As % of course takers**
Treatment	2222	18.0%	481	3.9%	21.6%
Delayed treatment	1212	13.6%	452	5.1%	37.3%
All schools	3434	16.1%	933	4.4%	27.2%

Likewise, when combining students who took at least one math or science AP course, the percentage of students taking at least one of these courses was higher in the treatment schools (17.7%) compared to the delayed treatment schools (15%). Conversely, the delayed treatment schools had a higher percentage of students who scored 3 or higher on at least one math or science AP exam (4.7% of all enrolled students and 31.6% of the students who took any math or science AP course) than the treatment schools (3.7%; 20.7%) (see Table 6).

Table 6

Outcome for Students Taking (or Scoring 3+) at Least One Math AP or Science AP Course

	Students taking AP course		Students with score of 3+		
Group	***n***	**%**	***n***	**%**	**As % of course takers**
Treatment	2195	17.7%	455	3.7%	20.7%
Delayed treatment	1340	15.0%	423	4.7%	31.6%
All schools	3535	16.6%	878	4.1%	24.8%

For the math, science, or English subject areas combined (see Table 7), the percentage of students who took at least one math, science, or English AP course was higher in the treatment schools (27.2%) than the delayed treatment schools (22.1%). In contrast, the percentage of students who scored 3 or higher on at least one math, science, or English AP exam was higher in the delayed treatment schools (8% of all enrolled students and 36% of the students who took any AP course in this category) than the percentage of students in the treatment schools (6.2%; 22.7%).

Table 7

Outcomes for Students Taking (or Scoring 3+) at Least One Math, Science, or English AP Course

	Students taking AP course		Students with score of 3+		
Group	***n***	**%**	***n***	**%**	**As % of course takers**
Treatment	3368	27.2%	764	6.2%	22.7%
Delayed treatment	1972	22.1%	710	8.0%	36.0%
All schools	5340	25.1%	1474	6.9%	27.6%

Figures 2 and 3 summarize the percentage of students who took at least one AP course in each subject category and the percentage of students who scored 3 or higher on at least one AP exam in each subject category, respectively. Figure 2 illustrates that a higher percentage of students in the treatment schools took at least one AP exam when compared with students in the delayed treatment schools across all subject area categories. The difference in percentage between the treatment and delayed treatment schools was largest for the math, science, or English category (5.1%) and smallest for math alone (0.3%).

In contrast, Figure 3 reveals a different pattern for the percentages of students who scored 3 or higher on at least one AP exam. Students in the treatment schools were slightly less likely to

score 3 or higher on at least one AP exam than students in the delayed treatment schools for every subject category. The differences in percentages of the outcomes among the students who enrolled in an AP course were very small between the treatment and delayed treatment schools, ranging from 0.5% for science to 2.1% when considering all subject areas together. As reported in Tables 1 to 6, however, when we look at student outcomes (score of 3 or higher) as a percentage of the number of students who took the course, there were sizable differences between the treatment and delayed treatment schools. In all subject areas, a greater percentage of course takers in the delayed treatment schools scored a 3 or higher on the AP exam, with the largest difference for English (15.7%) and the smallest for science (8%).

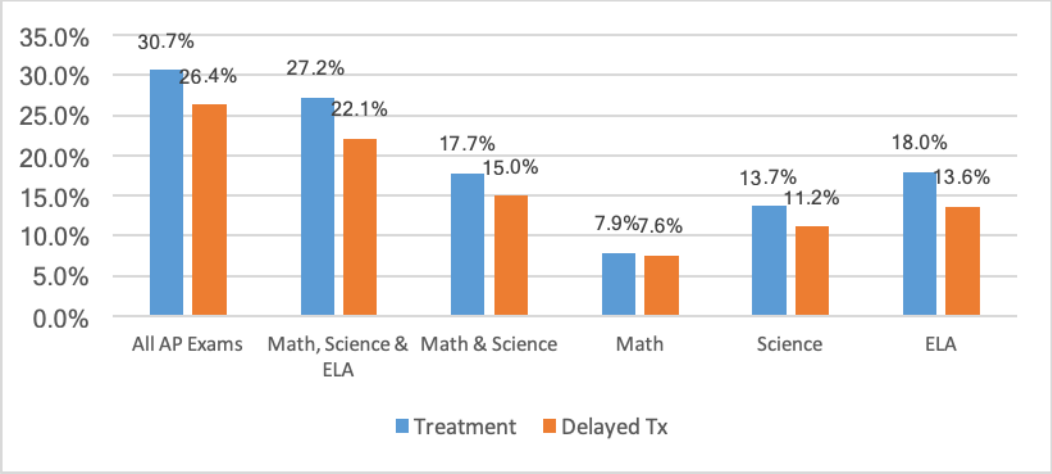

Figure 2. Percentage of students who took at least one AP course in each subject category.

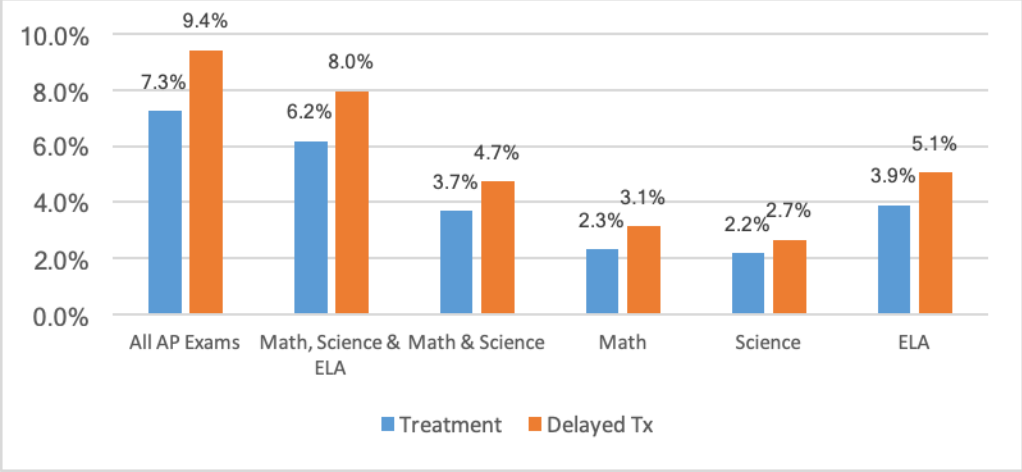

Figure 3. Percentage of students who scored 3 or higher on at least one AP exam in each subject category.

B. Statistical Model: 2-Level Hierarchical Generalized Linear Model

We used a 2-level hierarchical generalized linear model (HGLM) with students nested within schools to estimate the effectiveness of the CRP on the likelihood of a student taking AP courses and attaining a qualifying score of 3 or higher on AP exams. The effectiveness of the CRP was examined in six different subject categories: (a) math, (b) science, (c) English, (d) math or science, (e) math, science, or English, and (f) any AP courses.

The primary outcomes for the 2-level HGLM were binary: (1) whether or not a student took at least one AP course (coded as 0 for not taking an AP course; 1 for taking one or more AP courses), and (2) whether or not a student earned a qualifying score of 3 or higher on at least one AP exam in a subject category (coded as 0 for not achieving qualifying scores in AP exams; 1 for achieving qualifying scores in AP exams).

The 2-level HGLM included one school-level treatment indicator variable. To increase the precision of the treatment effect estimate, this model was further extended by adding the prior year's school-level performance on the AP exam as a covariate. Thus, for each outcome variable, two HGLMs were analyzed: (1) 2-level HGLM with the school-level treatment indicator; and (2) 2-level HGLM with the school-level treatment indicator and the school-level performance on the 2016 AP exam. Table 8 provides the complete list of the outcome variables for each subject category from the 2017 AP exam data and their respective covariates from the 2016 AP exam data.

a. 2-Level HGLM With a School-Level Treatment Indicator

A binary response Y_{ik} was the outcome for student i either in the 11th or 12th grade in school k. As the outcomes of interest were binary, we used a binomial sampling, defining the probability of the response equal to one as $\varphi_{ik} = Pr\,(Y_{ik} = 1)$ and let φ_{ik} be modeled using a logit link function. Note that we have two outcomes of interest: a) binary response of whether a student took an AP course; b) binary response of whether a student's AP exam score were 3 or higher. Analyses were conducted separately for each outcome. The level 1 model was specified as follows:

$$\eta_{ik} = \log\left(\frac{\varphi_{ik}}{1-\varphi_{ik}}\right) = \pi_{0k}\,, \qquad (1a)$$

At level 2, the school-level treatment indicator Trt_k was included. Trt_k was coded 0 for comparison schools (i.e., delayed treatment schools) and 1 for CRP schools (i.e., treatment schools). The Level 2 model was defined as:

$$\pi_{0k} = \gamma_{00} + \gamma_{01}Trt_k + r_{0k} \qquad r_{0k} \sim N(0, \nu_0) \qquad (1b)$$

γ_{00} represents the average log-odds of students taking at least one AP course (or scoring 3 or higher on at least one AP exam) for the comparison schools. γ_{01} is the main effect of the

treatment, which captures the difference in log-odds of taking at least one AP course (or scoring 3 or higher on at least one AP exam) between the comparison and the CRP schools.

b. 2-Level HGLM With a School-Level Treatment Indicator and the Prior Year's AP Exam Performance as a Covariate

The level 1 model is the same as the above model (1a). Compared with 1b, the level 2 model was extended by including the school-level covariate, $pr2016_k$. This covariate was defined as the percentage of students in the 2015–2016 school year who took an AP course (or scored 3 or higher on an AP exam) in an equivalent subject category as the 2017 AP data. The parameter γ_{01} in Equation 2a captures the difference in log-odds of taking at least one AP course (or scored 3 or higher on an AP exam) between the comparison and the CRP schools, controlling for the effect of the covariate. The extended level 2 model was specified as:

$$\pi_{0k} = \gamma_{00} + \gamma_{01}Trt_k + \gamma_{02}pr2016_k + r_{0k} \qquad r_{0k} \sim N(0, \nu_0) \qquad (2a)$$

Table 8

Outcomes and Covariate in 2-Level HGLM

Outcome	Covariate (% of students in school in 2015–2016 school year)
Math course taking	Math course taking, 2016
Science course taking	Science course taking, 2016
Math or science course taking	Math or science course taking, 2016
English course taking	English course taking, 2016
Math, science, or English course taking	Math, science, or English course taking, 2016
Any AP course taking	Any AP course taking, 2016
Math: AP exam score 3 or higher	Math: AP exam score 3 or higher, 2016
Science: AP exam score 3 or higher	Science: AP exam score 3 or higher, 2016
Math or science: AP exam score 3 or higher	Math or science: AP exam score 3 or higher, 2016
English: AP exam score 3 or higher	English: AP exam score 3 or higher, 2016
Math, science, or English: AP exam score 3 or higher	Math, science, or English: AP exam score 3 or higher, 2016
Any AP exam scored 3 or higher	Any AP exam scored 3 or higher, 2016

C. Results from 2-Level Hierarchical Generalized Linear Model

a. Likelihood of Students Taking an AP Course

We first present the 2-level HGLM results where the outcome is whether or not a student took at least one AP course in a subject category. Table 9 reports the estimates (in logit scale) of

all the fixed effects, *p* values, and the associated predicted probabilities of students taking at least one AP course for each subject category. As noted above, γ_{00} represents the average log-odds of students taking at least one AP course for the delayed treatment schools and γ_{01} is the main effect of the treatment, which captures the difference in the log-odds of students taking at least one AP course between the study conditions. Thus, the linear combination of $\gamma_{00} + \gamma_{01}$ represents the average log-odds of students taking at least one AP course for the treatment schools. The predicted probabilities are calculated from the predicted logit of the fixed estimates given the random effect r_{0k} is 0.

For math, the estimate of intercept γ_{00} was -2.75 with the *p* value smaller than 0.05, indicating that the expected log-odds of students in the delayed treatment schools taking at least one math AP course was -2.75 which is significantly different from 0. This estimate corresponds to a probability of 1/(1+exp[2.75]) = 0.06. The estimate of treatment effect (γ_{01} = 0.18, *p* value = 0.57) was positive but was not statistically significant at the 0.05 level. This implies that the expected log-odds of students in the treatment schools taking at least one math AP course was -2.75 + 0.18 = -2.57 corresponding to a predicted probability of 1/(1+exp[2.57])=0.07. However, the difference in the log-odds of taking a math AP course between the study conditions was not significant.

Similar results were obtained for science. The estimate of intercept γ_{00} = -2.30 (*p* value < 0.05) and the estimate of the treatment effect γ_{01} = 0.17 (*p* value = 0.73). These results indicate that the expected log-odds of students in the delayed treatment schools taking at least one science AP course was -2.30 corresponding to a probability of 0.09 and the log-odds of students in the treatment schools was -2.30 + 0.17 = -2.13 (the predicted probability = 0.11). These results suggest that the difference in log-odds of students taking a science AP course between the study conditions is not statistically significant at the 0.05 level.

Likewise, the results for English showed that the estimate of intercept was -1.88, and the estimate of the treatment effect was 0.33 (*p* value = 0.23). These results indicate that the expected probabilities of taking at least one English AP course in the delayed treatment schools and the treatment schools were, respectively, 0.13 and 0.17.

As would be expected, similar results were found both in the math, science, or English category as well as for any AP courses. The treatment effects for these subject categories were not statistically significant at the 0.05 level (γ_{01} = 0.41, *p* value = 0.3 for Math or Science; γ_{01} = 0.11, *p* value = 0.67 for math, science, or English; γ_{01} = 0.42, *p* value = 0.21 for all AP exams).

Overall, being in the schools which implemented CRP corresponded with a more positive log-odds estimate of taking at least one AP course for all subject categories. Despite the positive

values of fixed effect estimates of γ_{01}, the results indicate that the effectiveness of CRP was not statistically significant at the 0.05 level. These results were also supported by the small increments in the predicted probabilities between the delayed treatment and treatment schools, ranging from 0.01% in math and 0.1% in any AP courses.

Table 9

2-Level HGLM Results: AP Course Taking as Outcome

Outcome	Fixed effect	Estimate	*p* value	Predicted probability
Math	$\gamma_{00,}$ Intercept	-2.75	0.00	0.06
	$\gamma_{01,}$ Trt	0.18	0.57	0.07
Science	$\gamma_{00,}$ Intercept	-2.30	0.00	0.09
	$\gamma_{01,}$ Trt	0.17	0.73	0.11
Math or science	$\gamma_{00,}$ Intercept	-1.85	0.00	0.14
	$\gamma_{01,}$ Trt	0.41	0.30	0.19
English	$\gamma_{00,}$ Intercept	-1.88	0.00	0.13
	$\gamma_{01,}$ Trt	0.33	0.23	0.17
Math, science, or English	$\gamma_{00,}$ Intercept	-1.17	0.00	0.24
	$\gamma_{01,}$ Trt	0.11	0.67	0.26
All AP courses	$\gamma_{00,}$ Intercept	-0.93	0.00	0.28
	$\gamma_{01,}$ Trt	0.42	0.21	0.38

b. Likelihood of Students Scoring 3 or Higher on an AP Exam

Table 10 provides the results of 2-level HGLM with the outcome of the likelihood of scoring 3 or higher on an AP exam. For math, the estimate of intercept γ_{00} = -4.00 (*p* value < 0.05) represents the expected log-odds of students in the delayed treatment schools scoring 3 or higher on at least one math AP exam, and the predicted probability is 0.02. The estimate of treatment effect was γ_{01} = - 0.53 (*p* value = 0.22), indicating that the log-odds of students in the treatment schools scoring 3 or higher was lower than the log-odds for the delayed treatment school by 0.53, corresponding to a decrease in the probability by 0.01. However, the decrease in the log-odds between the study conditions was not statistically significant at the 0.05 level.

Similar results were obtained for science. The estimate of intercept γ_{00} = -4.21 (*p* value < 0.05) and the estimate of the treatment effect γ_{01} = -0.32 (*p* value = 0.49). These results indicate

that the expected log-odds of students scoring 3 or higher on at least one science AP exam was -4.21 and -4.53 for the delayed treatment and the treatment schools, respectively. Both estimates were associated with the same predicted probability of 0.01. These results suggest that the log-odds of students scoring 3 or higher on a science AP exam was lower for the treatment schools by 0.32, but the difference between the two groups was not statistically significant at the 0.05 level.

The results for English also showed the same trend. The estimates of the treatment effect were -3.50 (*p* value < 0.05) and -0.71 (*p* value = 0.14), respectively. The predicted probabilities for the delayed treatment and the treatment schools were 0.03 and 0.01, respectively. The treatment effect was not statistically significant at the 0.05 level.

As expected, similar results were found when looking at the three combined subject categories. The treatment effects for these subject categories on the likelihood of students scoring 3 or higher on an AP exam were not significant at the 0.05 level (γ_{01} = -0.33, *p* value = 0.42 for math or science; γ_{01} = -0.64, *p* value = 0.12 for math, science or English; γ_{01} = -0.45, *p* value = 0.25 for any AP exams).

Taken together, the results indicate that being in the treatment schools resulted in a slightly lower log-odds of a student scoring 3 or higher on at least one AP exam for every subject category. However, the estimate of the treatment effect was not statistically significant at the 0.05 level. These were also confirmed by the negligible changes in the predicted probabilities between the treatment and delayed treatment schools, where the largest difference was 3% for all AP courses. The above findings from Table 8 and Table 9 agree with those from the descriptive statistics in the previous section.

Table 10

2-Level HGLM Results: AP Score of 3 or Higher as Outcome

Outcome	Fixed effect	Estimate	*p* value	Predicted probability
Math: score 3 or higher	$\gamma_{00,}$ Intercept	-4.00	0.00	0.02
	$\gamma_{01,}$ Trt	-0.53	0.22	0.01
Science: score 3 or higher	$\gamma_{00,}$ Intercept	-4.21	0.00	0.01
	$\gamma_{01,}$ Trt	-0.32	0.49	0.01
Math or science: score 3 or higher	$\gamma_{00,}$ Intercept	-3.50	0.00	0.03
	$\gamma_{01,}$ Trt	-0.33	0.42	0.02
English: score 3 or higher	$\gamma_{00,}$ Intercept	-3.50	0.00	0.03
	$\gamma_{01,}$ Trt	-0.71	0.14	0.01
Math, science, or English: score 3 or higher	$\gamma_{00,}$ Intercept	-2.82	0.00	0.06
	$\gamma_{01,}$ Trt	-0.64	0.12	0.03
All AP courses: score 3 or higher	$\gamma_{00,}$ Intercept	-2.66	0.00	0.07
	$\gamma_{01,}$ Trt	-0.45	0.25	0.04

c. Likelihood of Students Taking an AP Course Controlling for Prior Year's School-Level Performance

To increase the precision of the treatment effect estimate, we further examined the treatment effect with the school-level AP performance in the previous year as a covariate. Table 11 presents the results of these analyses. In general, we can see that the effects of covariate γ_{02} were all positive and statistically significant at the 0.05 level (γ_{02} = 0.19 for math; γ_{02} = 0.10 for science; 0.07 for English; γ_{02} = 0.08 for the math or science and the math, science, or English categories; γ_{02} = 0.03 for any AP course with *p* values < 0.05). These estimates indicate that not surprisingly, the prior school-level AP performance had a significant association with the likelihood of students taking an AP course.

Focusing on the main effect of the treatment γ_{01}, being in the treatment schools did not have a statistically significant association with the log-odds of a student taking at least one AP course for every subject category, holding constant the effect of the 2016 school-level AP performance. Similar to those from the previous models, the estimates of treatment effect for math (γ_{01} = 0.07, *p* value = 0.74), science (γ_{01} = 0.22, *p* value = 0.63), math or science (γ_{01} = 0.40, *p* value = 0.25), and math, science, or English (γ_{01} = 0.32, *p* value = 0.07) were positive values but not statistically significant at the 0.05 level.

Interestingly, however, the effectiveness of the CRP for English was found to be significant at the 0.05 level. Specifically, the estimate of treatment effect γ_{01} was 0.49, which was statistically significant at the 0.05 level. The predicted probabilities for the delayed treatment and the treatment schools were 6% and 10%, respectively, after controlling for the effect of last year's school AP performance.

Table 11

2-Level HGLM Results: AP Course Taking as Outcome and 2016 AP Performance as Covariate

Outcome	Fixed effect	Estimate	*p* value	Predicted probability
Math	$\gamma_{00,}$ Intercept	-3.28	0.00	0.04
	$\gamma_{01,}$ Trt	0.07	0.74	0.04
	$\gamma_{02,}$ pr2016	0.19	0.00	
Natural science	$\gamma_{00,}$ Intercept	-2.81	0.00	0.06
	$\gamma_{01,}$ Trt	0.22	0.63	0.07
	$\gamma_{02,}$ pr2016	0.10	0.00	
Math or science	$\gamma_{00,}$ Intercept	-2.39	0.00	0.08
	$\gamma_{01,}$ Trt	0.40	0.25	0.12
	$\gamma_{02,}$ pr2016	0.08	0.00	
English	$\gamma_{00,}$ Intercept	-2.69	0.00	0.06
	$\gamma_{01,}$ Trt	0.49	0.03	0.10
	$\gamma_{02,}$ pr2016	0.07	0.00	
Math, science, or English	$\gamma_{00,}$ Intercept	-2.17	0.00	0.10
	$\gamma_{01,}$ Trt	0.32	0.07	0.14
	$\gamma_{02,}$ pr2016	0.08	0.00	
All AP courses	$\gamma_{00,}$ Intercept	-1.48	0.00	0.18
	$\gamma_{01,}$ Trt	0.49	0.11	0.27
	$\gamma_{02,}$ pr2016	0.03	0.00	

d. Likelihood of Students Taking an AP Exam Controlling for Prior Year's School-Level Performance

Table 12 provided the fixed effect estimates, *p* values, and associated predicted probabilities of students scoring 3 or higher on at least one AP exam for each subject category after controlling for the effect of the 2016 school-level AP performance.

The treatment effects in Table 12 were not statistically significant holding constant the previous year's school AP performance (γ_{01} = 0.66, *p* value = 0.08 for science; γ_{01} = 0.10, *p* value = 0.77 for English; γ_{01} = 0.19, *p* value = 0.56 for math or science; γ_{01} = 0.07, *p* value = 0.81 for math, science, or English). As with the results in Table 11, however, the effects of covariate γ_{02} were statistically significant at the 0.05 level (γ_{02} = 0.55 for math; γ_{02} = 1.08 for science; 0.43 for English; γ_{02} = 0.49 for the math or science category; γ_{02} = 0.39 for the math, science, or English category; γ_{02} = 0.14 for any AP exams with *p* values < 0.05).

Table 12

2-Level HGLM Results: AP Score of 3 or Higher as Outcome and 2016 AP Performance as Covariate

Outcome	Fixed effect	Estimate	*p* value	Predicted probability
Math: score 3 or higher	$\gamma_{00,}$ Intercept	-4.59	0.00	0.01
	$\gamma_{01,}$ Trt	-0.25	0.45	0.01
	$\gamma_{02,}$ pr2016	0.55	0.00	
Science: score 3 or higher	$\gamma_{00,}$ Intercept	-5.48	0.00	0.00
	$\gamma_{01,}$ Trt	0.66	0.08	0.01
	$\gamma_{02,}$ pr2016	1.08	0.00	
Math or science: score 3 or higher	$\gamma_{00,}$ Intercept	-4.44	0.00	0.01
	$\gamma_{01,}$ Trt	0.19	0.56	0.01
	$\gamma_{02,}$ pr2016	0.49	0.00	
English: score 3 or higher	$\gamma_{00,}$ Intercept	-5.02	0.00	0.01
	$\gamma_{01,}$ Trt	0.10	0.77	0.01
	$\gamma_{02,}$ pr2016	0.43	0.00	
Math, science, or English: score 3 or higher	$\gamma_{00,}$ Intercept	-4.17	0.00	0.02
	$\gamma_{01,}$ Trt	0.07	0.81	0.02
	$\gamma_{02,}$ pr2016	0.39	0.00	
All AP courses: score 3 or higher	$\gamma_{00,}$ Intercept	-3.63	0.00	0.03
	$\gamma_{01,}$ Trt	-0.05	0.88	0.02
	$\gamma_{02,}$ pr2016	0.14	0.00	

V. Results for Implementation Evaluation

The fidelity matrix of implementation defines the key components of the CRP program depicted in the CRP logic model (see Figure 1), measures of each component, scoring rubrics of measures, and criteria of fidelity. Based on this fidelity matrix, implementation information was collected from administrative records, surveys, and interviews.

A. Fidelity Matrix

The fidelity matrix approach collected information based on observable and measurable indicators relating to key program indicators. The CRP logic model posits that the key components of the intervention are school, teacher, and student supports. The idea was to measure fidelity separately for each key component of the intervention and define threshold values (in collaboration with NMSI) to determine whether the intervention was implemented with fidelity. As a starting point, we used fidelity indicators developed and field-tested (e.g., Sherman, et al., 2015), and created an implementation fidelity matrix which links the key components of the intervention to their indicators, the data source, the indicator scoring system, and the implementation threshold values (see Appendix A).

Fidelity was measured separately for each key component of the intervention to determine whether the intervention was implemented with fidelity.

In some cases implementation could be measured on a yes/no basis (e.g., did schools receive materials, or were exam fees paid by NMSI). These elements were considered to have been implemented with fidelity if in at least 80% of the schools they were implemented as planned. Some program elements required a number of individuals participating in an event (e.g., attending a summer training session, or attending three student study sessions). In these cases, if 80% of identified staff or students attended, these elements were considered to have been implemented with fidelity.

B. Surveys and Interviews

We also collected implementation information from surveys and interviews. Interview and survey data collected for the study allow us to determine how components of the program function in "real-world contexts," and provide support and validation for the fidelity matrix data. More importantly, these data help us learn how components of the program are viewed by those within the school, and how teachers can be supported so programs function effectively and lead to positive change. Obtaining teachers' firsthand views and opinions provides unique insight into what is necessary to build and sustain an effective AP program and supportive school culture, and if need be, provide formative feedback to help guide modifications or enhancements. Teachers are more likely to understand the complexity of their particular school, classroom, and student population and are most closely connected to actual program implementation.

To determine the perceived effectiveness of program elements we created an online survey and interview protocol. The survey focused on the key components of the CRP: teacher training, student supports, administrative support, monetary incentives, additional instruction (via Saturday sessions), classroom supplies/equipment, and change in school culture as relates to the

AP program. The online survey questions were used as a basis for the interview protocol and allowed us to expand on topics in the survey. The measure was based on one created for previous studies of the CRP (Cross, Kilpatrick, & LaMonica, 2012), with additional items added for this project.

a. Online Surveys

The online surveys were created using the web-based survey creation program Survey Monkey. Alternate versions were created for teachers and administrators. Prior to sending the surveys to participants we sent an introductory email explaining the research study, participation requirements, as well as the time frame for participation. Eligible participants were subsequently emailed a link to the survey with the study overview and an IRB-required consent form. Prior to the deadline, several reminder emails were sent.

b. Teacher Survey

The teacher survey contained 53 questions, although participants did not all answer every question. Skip logic was employed to allow teachers to move past a set of questions if they were not relevant or applicable. For example, item 21 asked teachers: "Did your school hold shared goal setting meetings to establish targets for student performance and enrollment in AP courses?" If the respondent's school did not hold shared goal setting meetings, they skipped past the goal setting meeting questions. The teacher survey measure is included as Appendix B along with information on the skip logic employed throughout.

The majority of survey questions were multiple choice, multiple select (respondents could choose more than one answer), or questions with a Likert scale (most often four-point). The first section of the survey included demographic questions (respondent's school, courses taught, grade level etc.) as well as questions on professional development participation. The rest of the survey sections were aligned to the CRP logic model constructs and addressed school support (3 items), teacher support (17 items) and student support (4 items).

c. Administrator Survey

The administrator survey was similarly constructed, albeit aligned to the administrative elements of the logic model. Thus, there were questions focused on coordination of the CRP, student supports, and administrator incentives, as well as identical questions to those on the teacher survey about effectiveness of program components on enrollment in AP courses and performance on AP exams. See Appendix C for the administrator survey measure.

d. Student Survey

Unlike the teacher and administrator surveys, the student surveys were paper booklets designed to be completed by hand in class. Following completion of the online teacher survey, a packet of student surveys specifically coded for the teacher and school were sent to the teacher with a return envelope. The survey consisted of 29 questions about the student's experience with the CRP and AP courses in general.

The survey began with five questions about the student's current AP workload, college aspirations, and the school's outreach efforts to students concerning AP course enrollment. The students were then asked 15 questions about the supports available to them, not limited to CRP components, including six questions intended to solicit qualitative assessments of the supports.

The survey continued with five questions about the student's perception of their own preparedness and potential obstacles to students taking their AP exams. The final four questions identified the various incentives offered to students and gauged the student's valuation of them. The incentives probed included CRP financial awards and other perceived benefits, such as weighted calculations of grade point average. See Appendix D for the student survey measure.

e. Teacher and Administrator Interviews

As a supplement to the surveys we created a set of teacher and administrator interview questions to provide more detailed information which may not have been gleaned from the online survey. The survey questions formed the basis of interviews with teachers and administrators, and additional questions were included as dictated by the nature of the conversation. We did not want to constrain teachers and so allowed the discussions to evolve as they progressed. Appendix E and Appendix F provide the initial set of interview questions for teachers and administrators.

C. Fidelity Matrix Results

The fidelity matrix relates to all components of the CRP, includes targets for each element of the program and requires 80% of schools meet specified targets. Incomplete data made completing the matrix in the way intended challenging. We did not receive administrator surveys from 12 schools, student surveys from five schools, and had incomplete student attendance records for the student study sessions. Data to complete the matrix was gathered from administrative records as well as survey and interview responses where necessary.

a. School-Level Indicators

School-level indicators included program management support, school-wide goal setting, and payment of administrator awards. Complete data were available for 16 schools or 57% of the

possible sample (and incomplete data for 12 schools). School-level indicators were all evaluated on a yes/no basis.

Seven specific school support measures were identified answering four key questions:

- Did NMSI and school personnel meet to set goals for the 2016–2017 school year?
- Were stipends paid to school administrators, as agreed?
- If goals were met, were Designated Administrator bonuses paid?
- Did Program Managers support the school by delivering student study session reminders and materials, assisting with teacher sign-ups for training and student study sessions, assigning mentors to AP teachers, and providing guidance to NMSI curricular support materials?

School personnel in 25 of the 28 treatment schools (89.3%) confirmed that a goal setting meeting took place. NMSI financial records indicated that the school administrator stipend and bonuses were paid to all qualifying schools. The Program Manager evaluation data were only obtained through the 16 completed Designated Administrator surveys. "Yes" responses to these survey items ranged from 87.5% (mentor assignment) to 100.0% (teacher sign-ups). Table 13 summarizes the school support measures across all schools and reveals that each program element was implemented with fidelity.

Table 13

School-Level Implementation Indicators

School-level indicator	# of responses	Yes responses	% Yes
Goal Meeting Held	28	25	89.3
Administrator Stipend Paid	28	28	100.0
Administrator Bonus Paid According to Agreement	28	28	100.0
Program Manager Support: Teacher Sign-Ups	16	16	100.0
Program Manager Support: Student Study Sessions	16	15	93.8
Program Manager Support: NMSI Materials	16	15	93.8
Program Manager Support: Mentor Assignment	16	14	87.5

b. Teacher-Level Indicators

Eight specific metrics were identified to evaluate teacher participation in the CRP and NMSI support of teachers. Eleven schools (39%) achieved a perfect score on the teacher support program elements. Table 14 summarizes the range of scores in the teacher measures.

Table 14

Measures of Teacher Participation and Support

Type	Score of 6	Score of 7	Score of 8
# of schools	3	14	11
% of schools	10.7%	50%	39.3%

The CRP supports teacher instruction by providing materials for the classroom, online access to instructional materials, mentoring, and off-site training. Financial records indicated that each school received funding to purchase school room materials and supplies, ranging from books to lab supplies. Teachers in 24 of the schools (85.7%) responded affirmatively when asked if they had the materials they need to teach their course effectively. Teachers in all 28 schools were made aware of the availability of online instructional resources and logged into the system at least once. Mentors were also offered to teachers in all 28 schools.

Schools were evaluated on the level of teacher participation in CRP training sessions by assessing whether teachers attended all three sessions available throughout the year (Advanced Placement Summer Institute, Fall Workshop, and Spring Training). If, in the aggregate, teachers attended 80% or more of the available training sessions, the school received a score of one and this was achieved by 13 schools (46.4%). Some teachers cited the weeklong commitment as an obstacle to attending the summer training, whereas other roles and responsibilities that teachers maintain (e.g., coaching, advising student organizations) can also make attendance during the school year challenging. Five schools (17.8%) had 100% teacher attendance at training sessions.

The CRP also offers financial support to teachers for participating in the program, both through a stipend and through awards tied to achieving goals. NMSI financial records confirmed that teachers at all 28 schools received stipend payments for program participation. For each student with an exam score of three or higher, teachers should have received an award of $100. Payments to teachers according to the agreement were verified for 27 schools (96.4%).

Across all schools teachers did not fulfill their requirements for attending training sessions, and so this component was not implemented with fidelity. The other seven program elements were implemented with fidelity in the aggregate across all schools.

c. Student Supports

Data on student attendance at the Saturday study sessions was not complete and so no calculation of overall implementation fidelity was possible. For the students for whom we did receive data, however, the overall attendance across schools was 55%. Fee subsidies were

offered to students at 60.7% of schools which indicates not implementing with fidelity. There may, however, have been instances of students receiving fee subsidies from other sources of which we were not aware. Students were promised a $100 award for each exam with a score of 3 or better. NMSI financial records confirm that payments were made as expected in 27 of the 28 schools (96.4%), indicating that this program element was implemented with fidelity. Out of a maximum aggregate score of two for the student measures, 12 schools scored the maximum (42.9%) and 16 schools achieved a score of one (57.1%).

d. Overall School-Level Fidelity

Each of the measures was tallied per school, and the school's total score was evaluated as a percentage of the maximum points available at that school. Twenty-three schools (82.1%) achieved 80% or better implementation fidelity, for an average fidelity score of 89.3%. Seven schools achieved a perfect 100% fidelity score. Table 15 represents the overall school-level fidelity.

Table 15

Overall School-Level Fidelity

School	Implementation fidelity score
CA school 1	94.1
CA school 2	88.2
GA school 1	76.9
GA school 2	100.0
IL school 2	92.3
IL school 3	82.4
IL school 1	100.0
LA school 1	88.2
MI school 1	92.3
MI school 2	92.3
MO school 1	94.1
MO school 2	100.0
MO school 3	94.1
ND school 1	92.3
ND school 2	94.1
ND school 3	92.3
OH school 3	100.0
OH school 1	82.4
OH school 2	82.4
OH school 4	84.6
PA school 1	100.0
PA school 2	100.0
PA school 3	100.0
TX school 1	76.9
TX school 3	69.2
TX school 4	84.6
TX school 2	69.2
TX school 5	76.9

In the aggregate by component, the percentage of schools that adequately implemented the measures ranges from 57.1% for the student-level measures to 100% for the school measure

(complete data). Table 16 delineates by component the number and percentage of schools performing at or above 80% fidelity.

Table 16

Schools Adequately Implementing Aggregate Measures by Component

Component	# of schools	# adequately implemented (at or above 80%)	% adequately implemented
School-level indicators (complete data)	16	16	100.0
School-level indicators (incomplete data)	12	10	83.3
Teacher-level indicators	28	25	89.3
Student-level indicators	28	16	57.1

D. Survey Results

The research objectives for this part of the evaluation study were to better understand teacher and administrator perspectives on the effectiveness or impact of key CRP components on student interest and success in AP and school culture. For all survey questions, frequencies for each response category were first calculated. Some questions required respondents to respond using Likert (4 or 3 points) or dichotomous scales. For these questions we calculated mean values to gain an understanding of average level of agreement with the statements. Some questions shared a common prompt. For these questions, we further computed the average of the set of item responses as a composite score per respondent and obtained descriptive statistics.

a. Response Rates

Completed surveys were received from 129 teachers (around 78% of the eligible sample). This represents a high level of participation, perhaps influenced by incentives offered to respondents (a $50 gift card) as well as pre-notice contact and several email reminder messages. We received a teacher survey from at least one teacher from each of the 28 schools in the sample, with a 100% response rate from 13 schools. Administrator surveys were received from 16 administrators. Table 17 provides the distributions of teachers responding to the survey by state, district, and school.

Table 17

Distribution of Teacher Survey Respondents by State, District, and School

State	District	School	*n*	%
CA	CA district	CA school 1	3	2.33
		CA school 2	5	3.88
GA	GA district	GA school 1	6	4.65
		GA school 2	5	3.88
IL	IL district	IL school 1	2	1.55
		IL school 2	3	2.33
		IL school 3	4	3.1
LA	LA district	LA school 1	7	5.43
MI	MI district	MI school 1	9	6.98
		MI school 2	7	5.43
MO	MO district	MO school 2	4	3.1
		MO school 1	4	3.1
		MO school 3	7	5.43
ND	ND district 1	ND school 1	4	3.1
		ND school 2	8	6.2
	ND district 2	ND school 3	5	3.88
OH	OH district	OH school 2	1	0.78
		OH school 1	2	1.55
		OH school 3	3	2.33
		OH school 4	2	1.55
PA	PA district 1	PA school 1	4	3.1
	PA district 2	PA school 2	8	6.2
	PA district 3	PA school 3	7	5.43
TX	TX district	TX school 3	2	1.55
		TX school 1	1	0.78
		TX school 4	4	3.1
		TX school 2	6	4.65
		TX school 5	6	4.65

b. Teacher Survey Response Summary

Over 90% of teacher respondents had three or more years of teaching experience. Fifty-nine teachers had a single subject credential and 43 multiple subject credentials. The majority of

respondents taught 12th grade (n = 108) and/or 11th grade (n = 106). Sixty-nine teachers taught 10th grade and 39 teachers ninth grade. On average, participants had been teaching for 13.06 years (SD = 8.36, Mdn = 12.00), and had been teaching AP courses an average of 4.75 years (SD = 5.36, Mdn = 3.00).

We divide the results from the surveys into teacher perceptions and opinions on the effects of the three categories of CRP components: (1) teacher, (2) student, and (3) school-focused on teacher knowledge and pedagogy, student outcomes, as well as student interest and participation in AP. Key teacher support components were training, mentoring, incentives, and resources.

c. Teacher Components

1. Training

Teachers participated in three training events: a four-day summer training, a two-day fall training and a one-day spring training. We asked teachers which of a set of statements was true for each of the three training sessions they attended. Specifically we were interested in how effective teachers found the training sessions for achieving stated goals. Figure 4 depicts the results of these survey items. In all cases, fewer teachers found the training sessions effective in helping them differentiate instruction for different ability level students (between 43% and 50%). The number of teachers, however, who felt more qualified to be an effective AP instructor increased throughout the year. After the summer training, 67% felt more qualified, after the fall training this increased to 71% and following the spring training, over three quarters of teachers felt more qualified to teach AP.

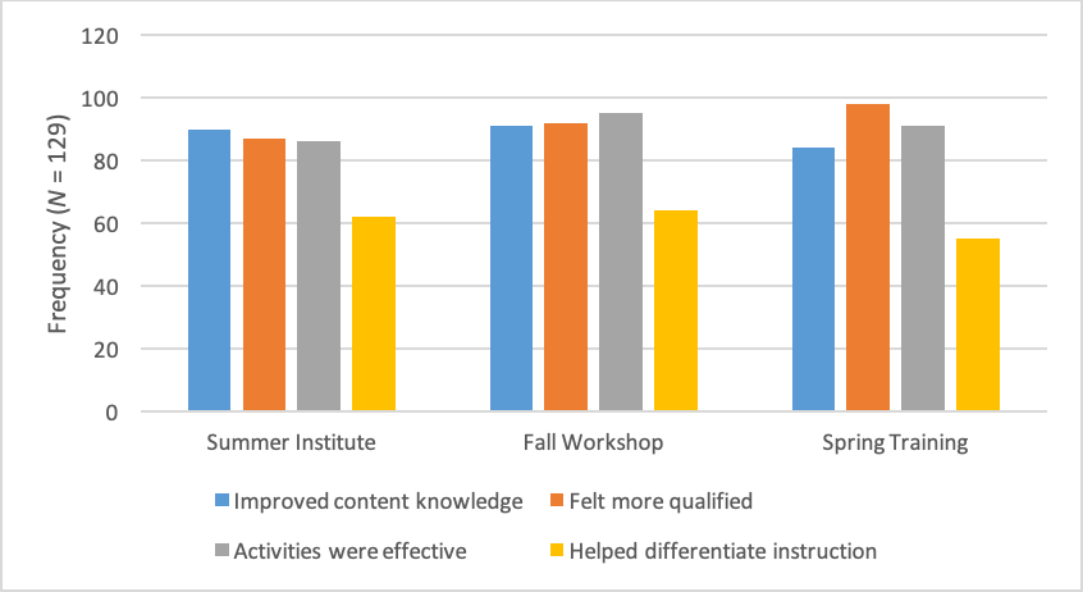

Figure 4. Teacher ratings of training efficacy.

We also asked teachers to indicate how much the CRP had improved their content knowledge, instructional skills, techniques and strategies. Half of the respondents felt that the CRP contributed to a major improvement in content knowledge (average rating was 2.48 on a three-point scale: 3 = *major improvement*, 2 = *slight improvement*, 1 = *no improvement*). Similarly, just over half of the respondents indicated improvement in their instructional skills and strategies following the CRP (average rating was 2.48).

The student-study sessions offered opportunities for teachers to observe expert teachers and learn new instructional techniques or strategies. We asked teachers to rate the extent of their agreement on a four-point scale with a set of statements about the student study sessions. For this set of questions the scale was 4 = *strongly agree*, 3 = *agree somewhat*, 2 = *disagree somewhat*, and 1 = *strongly disagree*. A separate item asked teachers to indicate how useful the sessions were for them. For this set of questions, the four-point scale was 4 = *extremely useful*, 3 = *useful*, 2 = *somewhat useful*, and 1 = *not at all useful*. Table 18 presents results for these questions combined together. Teachers' level of agreement for all statements was similar—ranging from an average of 2.94 to 3.06.

Table 18

Teacher Ratings of Student Study Session Efficacy

Student study session statements	*n*	*M*	*SD*
The study sessions highlighted the instructional needs of the students so I could continue to address them in class.	125	3.06	0.89
I learned a great deal from watching the expert teachers.	125	2.94	0.92
I was able to take the strategies employed during the study sessions back to the classroom to help improve student achievement.	123	3.02	0.93
How useful were study sessions for you?	124	3.02	0.93

Over 70% of teachers indicated the student study sessions were useful or extremely useful. Similarly, teachers expressed consistent views (over 70% of teachers reported somewhat or strong agreement) on the efficacy of the specific components of the study sessions shown in Table 18.

2. Mentoring

Teachers were asked if mentoring was offered to them through the CRP and 113 teachers (87.6%) indicated it was. Of this group, 43 teachers indicated they did not have any contact with the mentor. We asked the remaining group of teachers the extent of their agreement (on a four-

point scale, where 4 = *strongly agree*, 3 = *agree somewhat*, 2 = *disagree somewhat*, and 1 = *strongly disagree*) with a set of statements aligned to the mentoring objectives. Table 19 presents results for the mentoring-related questions. Teachers had the highest agreement relating to the preparedness of their mentor (M = 3.7, SD = .61), followed by agreement that the mentor helped improve content knowledge (M = 3.22, SD = .92). The most commonly provided support by mentors was information on pacing and sequencing of lessons (71%), with the least commonly provided support direct instruction or tutoring for CRP students (24%).

Table 19

Teacher Opinions of Mentoring

Mentoring-related statements	*n*	Mean	*SD*
The mentor was well-prepared	63	3.7	0.61
The mentor improved my content knowledge	63	3.22	0.92
The mentor honed my skills and techniques	61	3.1	0.94
Because of mentoring I am more effective	61	3.07	0.91

Note. Scale is 1 = *Strongly disagree*, 2 = *Disagree somewhat*, 3 = *Agree somewhat*, 4 = *Strongly agree.*

3. Incentives

Eighty-four percent of teachers (n = 107) indicated they were offered incentives (financial or otherwise) for teaching AP courses through the CRP. Almost all of these teachers stated they were offered financial incentives, with 58% indicating they were offered professional development opportunities and 6% were offered recertification points. Incentives were most commonly offered for students passing the AP exam (89%). Thirty-five percent of teachers said the incentives were not at all important in encouraging them to teach AP courses, with an additional 35% indicating the incentives were somewhat important. Only 8% of teachers reported the incentives to be an extremely important component in encouraging them to teach in the AP program.

4. Online Curricular Resources

We asked teachers which additional resources were offered for use in their AP courses. Sixty percent of teachers indicated they were offered access to online resources, and 65% of teachers indicated they were offered use of AP curriculum materials from the College Board. Twelve percent of teachers said they accessed the online resources daily, with one third accessing them weekly and one third accessing them monthly. Fifteen teachers indicated they did not access the online materials at all. Teachers who reported accessing CRP online materials (n = 111) most commonly did so to help familiarize students with the types of questions on the AP

exam (83%). The next most commonly selected use of materials was deepening instruction in specific content areas (71%) and conducting practice exams (70%). The least frequently chosen response was preparing for the student study sessions which was chosen by 23% of teachers (see Figure 5).

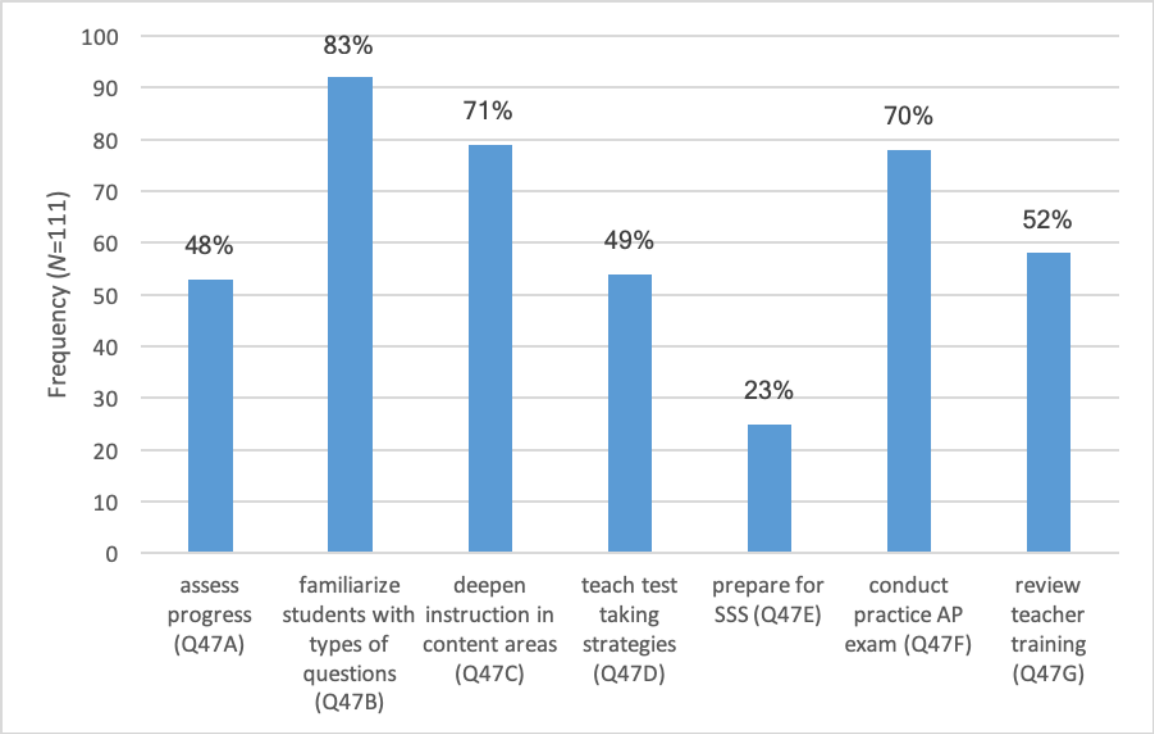

Figure 5. Teacher use of online resources.

5. Goal Setting

Forty-three percent of teachers reported their school held a goal-setting meeting, and of those teachers, 75% attended. The purpose of these meetings is to establish school-wide goals for enrollment in AP as well as student performance. Table 20 presents results from the goal setting meeting questions. Average agreement of meeting efficacy was 2.88 (*SD* = 0.71), with the highest average agreement for establishing goals for equitable access to AP coursework (*M* = 3.17, *SD* = 0.70).

Table 20

Teacher Perspectives on Goal Setting Meeting Impact and Efficacy

Statement	*n*	Mean	*SD*
Shared goal setting meeting was effective.	41	2.88	0.71
Shared goal setting meeting established enrollment goals.	40	3.05	0.64
Shared goal setting meeting established exam performance goals.	41	2.95	0.74
Shared goal setting meeting established goals for underrepresented students in AP courses.	41	3.10	0.80
Shared goal setting meeting established goals for equitable access to AP coursework.	41	3.17	0.70

Note. Scale is 1 = *Strongly disagree*, 2 = *Disagree somewhat*, 3 = *Agree somewhat*, and 4 = *Strongly agree.*

d. Overall Impact of the College Readiness Program on Enrollment and Achievement

Teachers were asked their opinions on the overall effectiveness of four program elements as they related to having an impact on student enrollment. The program elements were student financial incentives, teacher financial incentives, open enrollment, and teacher training. Specifically which of the four components was seen as the *most and least* effective for increasing student enrollment in AP courses. For the same four plus an additional two program components (online instructional resources and student study sessions) teachers were asked to select which component was the *most* and *least* effective at increasing student performance. Other survey items also included questions relating to student enrollment and achievement in AP courses.

1. Student Enrollment in AP Courses

Thirty-six percent of teachers (n = 129) chose student financial incentives as the most effective component of the CRP at increasing student enrollment in AP courses. The second most commonly selected response was teacher training (chosen by 32% of teachers). Teacher incentives were viewed as the most effective component influencing student enrollment by only 6% of teachers. We also asked teachers to indicate the least effective component of the CRP for increasing student enrollment. Forty-three percent of teachers chose the open enrollment policy as the least effective at increasing student enrollment, and 19% chose teacher incentives as the least effective component (see Figure 6).

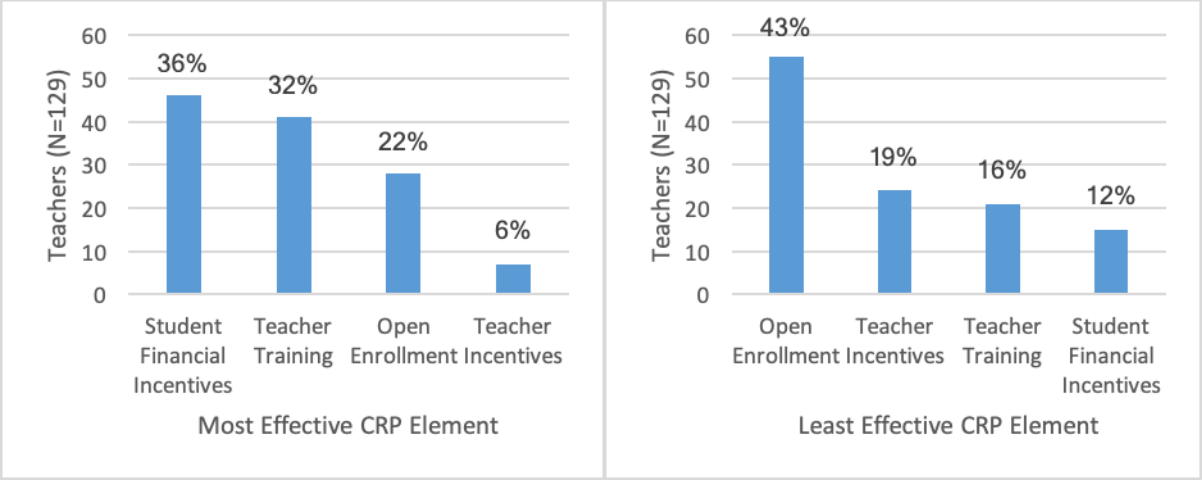

Figure 6. Teacher ratings for which elements of the CRP were most and least effective at increasing student enrollment in AP courses.

We asked teachers a follow-up question focusing on open enrollment specifically. Of the responding teachers (*n* = 115), 54% said that open enrollment had a positive impact on the AP program at their school. So even though teachers did not rank open enrollment as high as other program elements in terms of increasing enrollment, they did see it having an impact on the AP program as a whole—albeit not the most significant elemement compared to the other options. Teachers were also asked to indicate if, overall, the CRP was an effective way to increase student enrollment in AP courses. Seventy-four percent of teachers agreed the program did achieve this goal. Teachers were able to provide additional comments for this question. For those who did so (*n* = 18), some indicated that students were already encouraged to take AP courses at their school, others expressed concern that students be aware of the rigor associated with AP courses, and some teachers indicated it was too early to tell if there had been any impact. Twenty-nine percent of teachers agreed that the CRP contributed to a major improvement in recruitment of high-need and traditionally underrepresented students into AP course, and 57% of teachers felt it contributed to a slight improvement in this area.

To further explore factors relating to enrollment, we asked teachers to indicate reasons why qualified students may not have enrolled in AP courses in the past. The most common reason was the courses have a reputation as being difficult (68% of responses). Other reasons chosen included: students not realizing they were qualified to take AP courses (28% of responses), lack of outreach (20%), and inability to afford the exam fees (18%). Twenty-nine teachers provided additional comments for this question, citing student apprehension at the increased work load, concern about jeopardizing their GPA, lack of general interest, and scheduling difficulties as common reasons students have previously not enrolled in AP courses.

2. Student Performance in AP Courses

Thirty-six percent of teachers chose teacher training as the most effective component of the CRP at increasing student performance in AP courses and on AP exams, and one third of teachers chose the student study sessions as the most effective component. Only 16% of teachers chose student financial incentives as the most effective element (compared to 36% who saw them as the most important component for enrollment). Teacher incentives were chosen as the most important component for increasing student performance by only two teachers. Open enrollment was the most commonly selected component seen as the least effective at increasing student performance (45% of teachers), followed by teacher incentives, chosen as the least important component by 15% of teachers (see Figure 7 and Figure 8).

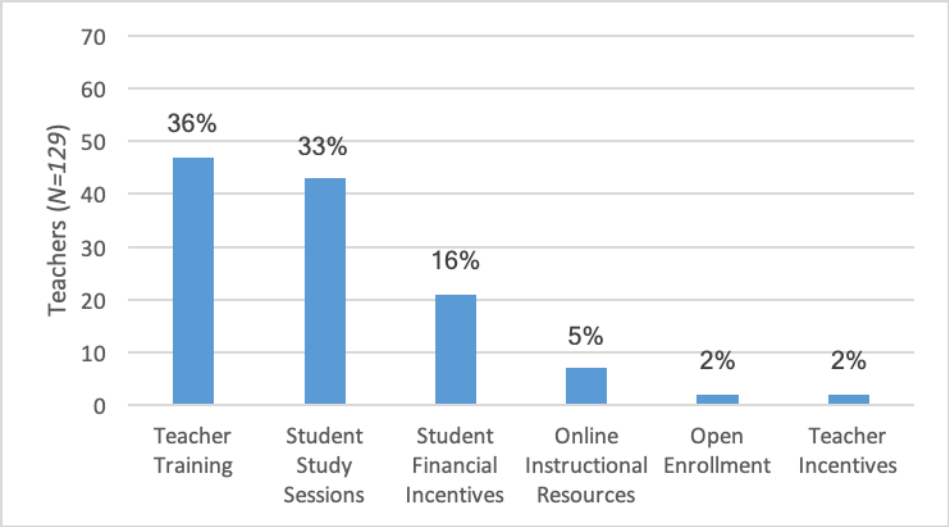

Figure 7. Teacher ratings for which program element was the most effective at increasing student performance.

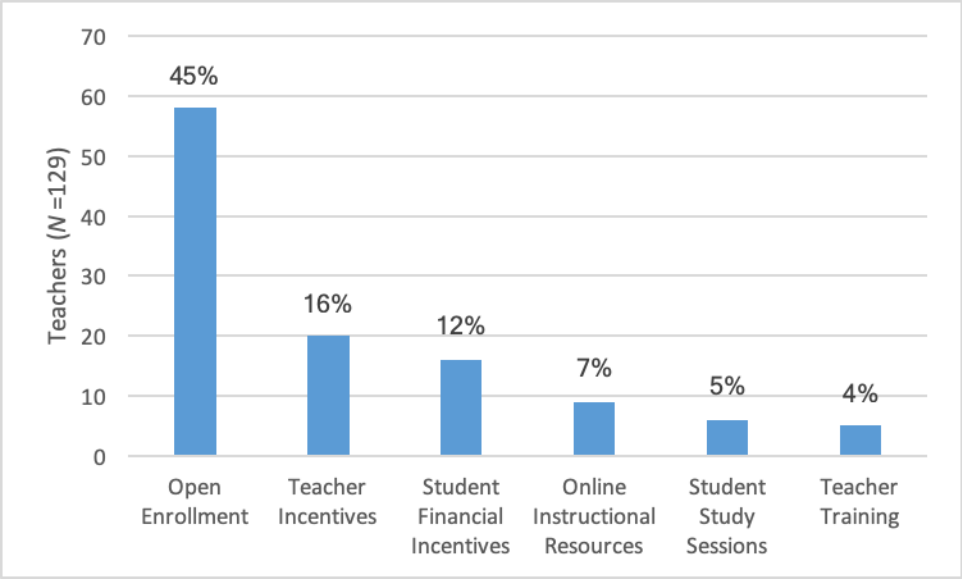

Figure 8. Teacher ratings for which program element was the least effective at increasing student performance.

e. Administrator Survey Results

Next we present findings from the administrator surveys. CRP administrators were asked their opinions on the effectiveness of elements of the CRP, specifically, (a) which element was seen as the most effective for increasing student enrollment in AP courses, and (b) which was the most effective at increasing student performance. Other survey items also included questions relating to both student enrollment and achievement in AP courses.

1. Overall Impact of CRP

a) Student Enrollment

Forty-four percent of surveyed administrators (n = 16) saw open enrollment as being the most effective program element related to student participation in AP courses (compared to 22% of teachers), followed by 31% who chose student incentives (compared to 36% of teachers). Teacher incentives were seen as the least effective element relating to student enrollment by 44% of the administrators (compared to 19% of teachers), and teacher training was the second most commonly selected element (chosen by 25% of respondents compared to 16% of teachers). The similarity between teachers and administrators was only in the view of student incentives as being one of the top two most effective program elements to encourage student enrollment. Interestingly, the number one choice for administrators was open enrollment, but this was the most frequently selected element (by teachers) as being the least effective element relating to increasing enrollment (see Figure 9).

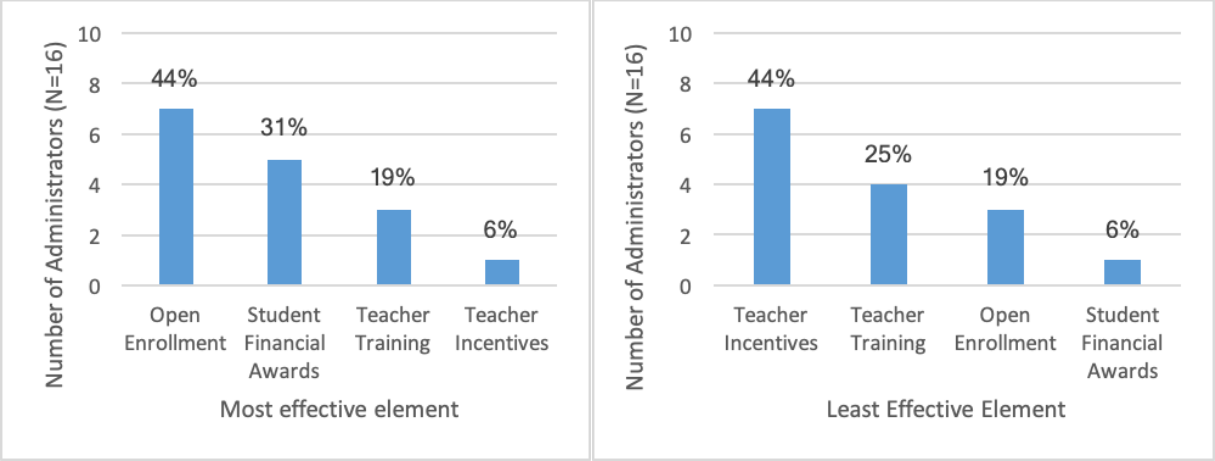

Figure 9. Administrator perspectives on which elements of the CRP were most and least effective at increasing student enrollment in AP courses.

A follow-up question focused specifically on open enrollment. Eighty-eight percent of administrators (14/16) said open enrollment had a positive impact on the AP program at their school, and 88% also indicated that the CRP was an effective way to increase student enrollment in AP courses. Respondents were able to provide additional comments for this question. For those who did so (n = 6), four indicated that the training, study sessions, and/or the student incentives were important components. One indicated that the CRP simply served as a supplemental resource for an existing AP program, and one administrator reported that the CRP could be seen as an effective way to increase AP enrollment, as long as the students were aware of the incentives. Sixty-three percent of respondents agreed that the CRP contributed to a major improvement in recruitment of high-need and traditionally underrepresented students into AP courses, and 25% felt it contributed to a slight improvement in this area.

b) Student Performance in AP Courses

Figure 10 shows results from part (b) which component was the most effective at increasing student performance. There was little variance in response for the most effective performance-related component: Fifty-six percent of administrators (n = 9) chose the student study sessions as the most important component relating to student achievement (compared to 33% of teachers), and 44% chose the teacher training as the most important (compared to 36% of teachers). Open enrollment was chosen by 38% of administrators as being the least effective (compared to 45% of teachers), with teacher incentives chosen by 25% (compared to 16% of teachers) (see Figure 10).

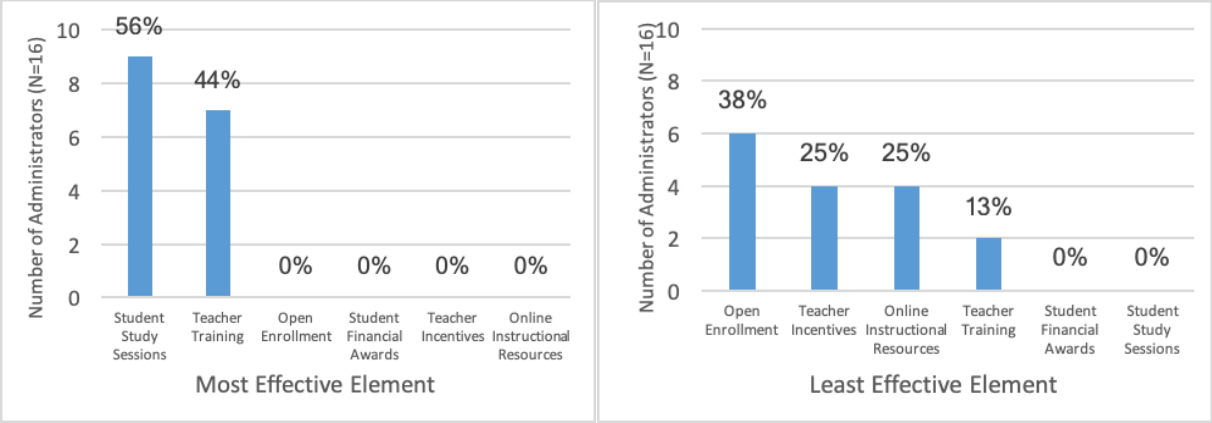

Figure 10. Administrator perspectives on which elements of the CRP were most and least effective at increasing student performance in AP courses.

An additional set of questions asked administrators to indicate the extent to which the CRP contributed to improvement in certain areas (see Table 21). The highest level of perceived improvement was in teachers' instructional skills, techniques, and strategies (M = 2.63, SD = .72), followed by students' content knowledge (M = 2.56, SD = 0.63). Seventy-five percent of respondents (n = 16) thought that the CRP contributed to a major improvement in teachers' instructional skills, and 63% indicated major improvement in students' content knowledge. Students' experience with STEM was rated as less impacted by CRP, with 56% of respondents indicating a slight improvement (M = 2.19, SD = 0.66). In all cases, however, the average impact was at least slight improvement.

Table 21

Administrator Perceptions of CRP-Related Improvement (n = 16)

Statement	*n*	Mean	*SD*
Students' content knowledge	16	2.56	0.63
Students experience with STEM AP courses	16	2.19	0.66
Recruitment of high-need and traditionally underrepresented students into AP courses	16	2.50	0.73
Teachers' content knowledge	16	2.50	0.63
Teachers' instructional skills, techniques and strategies	16	2.63	0.72
School culture of continuous improvement	16	2.38	0.72
School leadership valuing STEM learning	16	2.25	0.69

Note. Scale is 1 = *No improvement*, 2 = *Slight improvement*, and 3 = *Major improvement.*

f. Teacher Interviews

We interviewed 47 teachers from 17 schools in eight states as well as six administrators from six schools. This group of teachers represents a convenience sample of schools and teachers based on availability and scheduling constraints. Most teachers were interviewed at their school, and some were interviewed during their attendance at a summer training session in August 2017. Interview questions were drawn from and aligned to key themes of the online survey, but were open ended to encourage less restricted conversation.

1. Overall Efficacy of the CRP

We first asked teachers their opinions on the most important or effective component of the CRP. Forty-five percent of the teacher interviewee sample (n = 47) indicated the training was the most effective component, which mirrored the findings from the teacher surveys. The second most frequently stated component was resources (12.8%) followed by student study sessions (9%). Teachers often included additional effective elements in their responses. Considering all components mentioned as effective, 75% of teachers indicated the training and 62% referred to resources as effective components. All but one administrator listed the training as an effective component of the program. In addition to training, student study sessions, and resources, administrators also mentioned the funds for school supplies and equipment as an important part of the program.

Sixty-six percent of teachers and administrators felt that school culture had changed since the implementation of the CRP. However, almost half of the interviewees who felt the culture had not changed (7 of 15) said that it was most likely too soon to tell what impact the program would have on the school culture.

2. Training and Support

The majority of teachers (89%) were satisfied with the level of training and support received throughout the academic year as part of the CRP. Seventy-seven percent of teachers attended all three training sessions, and 98% attended at least one. For those who attended, 81% found the sessions useful. All but one teacher indicated they felt adequately prepared to teach their AP courses. Some administrators conducted classroom observations. These led one administrator to comment that instruction was more “clear,” and another noted that “teaching practices were enhanced.”

3. Mentoring

Ninety-six percent of teachers were offered a mentor, but only just over half of those teachers took advantage of the opportunity to meet with the mentor. The most common reason

teachers did not establish a mentee relationship was not having enough time (33%). Of those who met with the mentor, most (82%) found it beneficial. The two mentor activities most frequently cited as helpful were responding to questions from the teacher (noted by 74% of mentees) and providing supplemental resources to the teacher (33%).

4. Incentives

Teachers and administrators were about evenly split on how effective the student incentives were in terms of increasing student interest and enrollment in AP courses. The most frequently observed student motives for taken the AP courses were gaining college credit for the course and the benefit to the students' weighted high school grade point average.

Ninety-six percent of teachers indicated they were offered incentives to participate in the CRP, but most reported the incentives did not play a significant role in encouraging them to teach AP courses; 65% of respondents said the incentives were nice to have, but they did not factor into the decision to teach the course; and 30% of respondents indicated they were not motivating at all. Eighty percent of the administrators who discussed the program goals for students scoring 3 or higher on the exam felt some of the expectations for student performance were unrealistic.

We asked teachers if they would change anything about the CRP to help improve AP education at their school. The top two changes were improved communication with NMSI (17%) and changing the student study session scheduling (also 17%). The latter issue also emerged as a theme across many of the interviews. The scheduling of the study sessions on Saturdays posed significant problems for many students because of work and sports team commitments as well as other family-related obligations. Additionally, some students who rely on public transportation encountered issues with different weekend schedules, passes that work on weekdays only, and finding transportation to a different school. Some teachers also indicated that they would like more emphasis on test-taking strategies, and some felt that the student incentives should be awarded for attending the study sessions rather than achieving a particular score on the AP exam.

g. Student Surveys

Below we summarize data from the 877 students who responded to the CRP student survey (see Table 22 for distribution of respondents). Surveys were sent to teachers indicating interest and students completed paper-and-pencil copies which were then mailed back.

Table 22

Distribution of Student Survey Respondents by State and District

State	District	*n*	%
CA	CA district	98	11.17
GA	GA district	49	5.59
IL	IL district	36	4.1
LA	LA district	53	6.04
MI	MI district	116	13.23
MO	MO district	81	9.24
ND	ND district 1	89	10.15
OH	OH district	72	8.21
PA	PA district 1	26	2.96
	PA district 2	49	5.59
	PA district 3	38	4.33
TX	TX district	170	19.38

1. AP Courses

a) Number of AP Courses

The average number of math, science, and English AP courses taken by all students in the sample was 2.82 (*SD* = 1.82, *Mdn* = 2.00), with a range from 1–15.

b) AP Course Subjects

Figure 11 shows the number of specific AP courses students reported taking during 2016–2017. The largest number of respondents were taking English language (*n* = 472; 54%), followed by physics (*n* = 270; 31%).

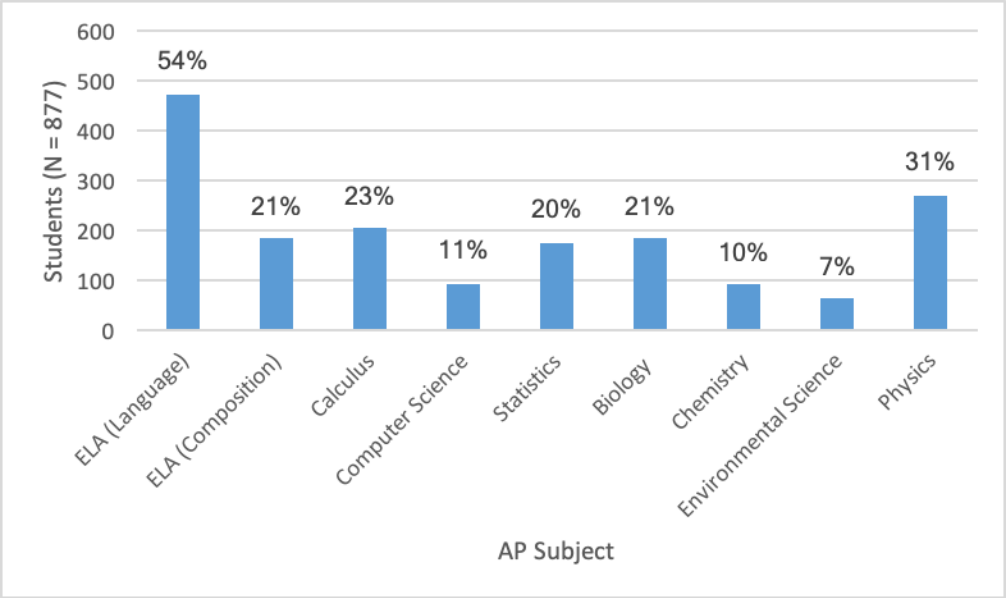

Figure 11. Number of AP courses taken by students in the survey study sample.

2. Knowledge of AP and the CRP

We asked students how they learned about the AP program in their school as well as how they learned about the CRP specifically. Most students learned about AP and the CRP from their teachers or school counselors, and more than a third of students learned about the AP courses from other students (see Table 23). In terms of learning about AP courses, responses in the "other" category included parents and family members, elementary/middle school teachers, NMSI, and the gifted coordinator. Some students indicated that they were just enrolled in the class, it was mandatory to enroll, or they were selected. When asked how they learned about the CRP, 22 of the students who responded "other" indicated that the survey was the first time they learned the name of the program.

Table 23

Sources of Student Knowledge of the AP and College Readiness Program

Source	Learn about AP	Learn about CRP
My AP Teachers	522 (59.5%)	635 (72.4%)
Other teachers at school	350 (39.9%)	138 (15.7%)
School counselor	408 (46.5%)	279 (31.8%)
Other students	333 (38%)	110 (12.5%)
School signs, emails, fliers	87 (9.9%)	47 (5.4%)
People outside school	39* (4.4%)	11 (1.3%)
Other	35 (4.0%)	31 (3.5%)

3. Future Educational Plans

Ninety-five percent of student respondents (n = 877) indicated they planned to attend some sort of postsecondary institution. Of these the highest level of education students planned to complete was two-year community/junior college (3%), four-year college/university (46%), and graduate school (46%).

4. Tutoring

Seventy-two percent of students were offered tutoring and tutoring was most often provided by AP teachers (75% of students chose this option). Of the students who were offered tutoring (n = 635), 22% did not attend at all, 32% attended less than once a month, 29% attended about once a month, 12% attended about once a week, and 5% attended more than once a week. On a four-point scale (1= *not at all useful*, 2 = *slightly useful*, 3 = *somewhat useful*, and 4 = *extremely useful*) students on average rated the tutoring a 3.2 (SD = 0.71), which is an average rating of somewhat useful.

Students were asked to indicate their level of agreement on a four-point scale (from 1 = *strongly disagree* to 4 = *strongly agree*) for a set of statements about their tutoring experiences. Students agreed most strongly on the content knowledge of their AP tutors (M = 3.68) and the least about AP tutors working on their specific needs (M = 3.05), but in all cases the average level of agreement was above 3 (see Table 24).

Table 24

Student Opinions on Tutoring

Statement	*n*	*M*	*SD*
My AP tutors understand the content they are teaching.	486	3.68	0.55
The tutoring improved my performance in the AP course.	487	3.21	0.68
The AP tutors worked on my specific needs during the sessions.	484	3.05	0.83
The tutoring sessions increase my confidence in my ability to successfully take the AP exams.	487	3.10	0.77
It was easy to schedule AP tutoring sessions.	487	3.24	0.78

5. Student Study Sessions

Students were next asked a set of questions about the Saturday study sessions. Students were required to attend three student study sessions for each AP course in which they were enrolled, although we learned through some of the teacher interviews that many students had difficulty attending the Saturday sessions because of conflicting demands and scheduling issues. Looking only at the sample of students who completed the survey (n = 877) students took an average of two AP courses (the median was also two). Therefore, the required number of student study sessions, on average, was six (two courses × three study sessions each). Students reported attending an average of only 2.02 in-person study sessions (SD = 1.96), and an average of 0.30 online study sessions (SD = 1.32). Thus, students were attending fewer than the required number of study sessions. Table 25 shows the average number of sessions students reported they attended by AP course subject.

Table 25

Averages for In-person and Online Study Sessions Per AP Course

AP courses	Enrolled students	In person		Online	
		Mean	*SD*	Mean	*SD*
English Language and Composition	472	1.89	1.48	0.15	1.20
English Literature and Composition	185	1.33	1.46	0.03	0.22
Calculus	205	1.88	3.20	0.13	0.53
Computer Science	94	0.61	1.13	0.09	0.94
Statistics	176	2.02	4.05	0.03	0.17
Biology	185	1.09	1.49	0.12	0.75
Chemistry	92	1.31	3.49	0.15	0.96
Environmental Science	64	1.03	2.96	0.05	0.31
Physics	270	1.60	1.56	0.10	0.46

Students learned about the study sessions most frequently from their AP teachers (94% of the time) as well as other teachers and school counselors. Just over 70% of the students did not have the same instructor for the study sessions, and 75% of students indicated that students from other schools attended. Of the 822 students who responded, the average rating of usefulness of the student study sessions was 3.01 (*SD* = 0.80), or somewhat useful.

6. Student Opinions About Study Sessions

We asked students how much they agreed with statements related to the study sessions, for each AP course they were taking. Table 26 presents the average agreement of student respondents by subject area (English, math, and science). On average, students had the lowest level of agreement that the in-person study sessions were conveniently scheduled (means ranged from 2.88 to 2.98 on a four-point scale). The highest level of agreement varied by subject area (see Table 26). Average responses by AP subject area are included in Appendix G.

Table 26

Student Responses to Study Session Statements

Statement	English overall	Math overall	Science overall
The study sessions increased my confidence	3.14 (0.73)	3.16 (0.77)	3.02 (0.79)
Improved my content understanding	3.16 (0.72)	3.18 (0.69)	3.05 (0.80)
Conveniently scheduled	2.98 (0.87)	2.97 (0.86)	2.88 (0.89)
Increased my confidence in my ability to take the AP exams	3.09 (0.76)	3.09 (0.78)	2.97 (0.85)
Improved my test-taking strategies	3.14 (0.77)	3.06 (0.81)	2.93 (0.87)

Note. 1 = *strongly disagree*, 2 = *disagree somewhat*, 3 = *agree somewhat*, and 4 = *strongly agree*.

7. AP Preparation

Students were asked to indicate their level of agreement with a set of statements related to their preparation for the AP exams (see Table 27). Lowest levels of agreement were found for statements relating to outside school support for increasing content understanding (M = 2.89, SD = .88) and improving test-taking strategies (M = 2.87, SD = 0.87). Students' highest level of agreement was related to their AP teachers' content understanding with an average agreement of 3.66 (SD = 0.57).

Table 27

Student Opinions on Factors Relating to AP Preparation

Statement	*n*	Mean	*SD*
My AP teachers understand the content they are teaching.	832	3.66	0.57
The support the school provides outside of the classroom improved my study skills.	830	2.85	0.89
I am confident in my ability to successfully complete AP courses.	832	3.26	0.72
I am confident in my ability to successfully take AP exams.	832	3.10	0.77
The support the school provides outside of the classroom increased my understanding of the course content.	828	2.89	0.88
I was nervous about how hard the AP courses would be when I signed up for them.	829	3.18	0.88
I am confident in my ability to learn new STEM content.	831	3.22	0.72
The support the school provides outside of the classroom improved my test taking strategies.	826	2.87	0.87

Note. 1 = *strongly disagree*, 2 = *disagree somewhat*, 3 = *agree somewhat*, and 4 = *strongly agree*.

8. AP Exams

Most students (n = 728) indicated they were planning on taking the AP exam for all their AP classes. We asked students who indicated they were not taking the exam the reason for their decision. Responses by general content area are shown in Table 28. In science, 70% of respondents said they were not ready to take the exam, compared to 42% of math test-takers and 19% of English. Across all subject areas, fewer students cited college acceptance of AP scores to be a factor. Close to half of the respondents indicated they could not afford to take the exam, however fewer students indicated the cost of the AP exams was too much (see Table 28).

Table 28

Student Responses to Reasons for Not Taking AP Exams

Statement	Science (n = 26)	Math (n = 26)	English (n = 41)
I don't see any benefit in taking AP exams.	9 (31)	7 (29)	5 (24)
I am not ready to take my AP exam.	21 (70)	10 (42)	4 (19)
I can't afford to take the exam.	15 (50)	10 (42)	11 (52)
I am taking too many AP exams.	8 (27)	7 (28)	3 (14)
My course load is too heavy to prepare for another test.	12 (40)	10 (42)	8 (38)
The college I'm going to doesn't accept AP scores.	2 (7)	3 (12.5)	1 (5)
The cost of all of my AP exams is too much.	9 (30)	5 (21)	3 (15)

Note. The number in parentheses indicates the percentage (%) of students who chose each response option.

9. Student Incentives and Rewards

Students were asked which rewards were offered to them to participate in AP courses. Sixty-five percent of students were offered cash awards for performance on the AP exam and 44% indicated they had their AP exam fee waived. Weighted grades (58%) and scholarship incentives (32%) were also cited as incentives. To earn the rewards two-thirds of the students indicated they had to pass the AP exam (with a score of 3 or higher), 34% had to enroll in an AP course, 48% had to complete and pass an AP course, and 40% indicated they had to take the AP exam. On a four-point scale students rated the importance of the incentives an average of 2.98 (SD = 0.9) indicating the incentives (overall) were somewhat important.

VI. Summary

The impact findings for the first year of the independent evaluation of NMSI's i3 scale-up grant indicated:

- The percentage of students who took at least one AP exam was higher in schools implementing the CRP than in the control schools. However, this difference is not statistically significant.
- Also, the percentage of students scoring 3 or higher on at least one AP exam was lower in the treatment schools than in the control schools, however, this difference is not statistically significant either.
- These findings were confirmed by the small changes in the predicted probabilities of taking an AP course and scoring 3 or higher on an AP exam between the treatment and the control schools.

A summary of findings from the teacher and administrator surveys and interviews follows:

- S*tudent enrollment:* Student financial incentives were seen to be the most effective at increasing student enrollment in AP courses, with open enrollment seen as the least effective.
- *Student achievement:* Teacher training was seen as the most effective component of the CRP related to student achievement and open enrollment the least effective. Teachers reported positive feedback on the training and indicated an increase in content knowledge. This suggests the CRP PD is meeting a need and helping prepare teachers to feel better equipped to teach AP courses.
- *Study sessions:* Student study sessions were viewed as an important and positive component of the program. The AP courses cover a lot of content and the study sessions were seen as helpful for providing students' additional instructional time as well as teaching support and guidance for teachers. Many teachers mentioned in the interviews that the study sessions provided excellent resources for classroom use. Attendance at the study sessions was not as high as we would have expected, and one reason for this may be the scheduling issues. Students who responded to the survey indicated lower levels of agreement on the convenience of study session scheduling. Saturday scheduling posed significant problems for many students because of work and sports team commitments as well as other family-related obligations.
- *Teacher incentives:* While teachers consistently said incentives didn't matter, they often clearly thought of them as (poor) compensation for the many additional hours of work involved in the program—particularly training and the student study sessions. Many teachers also reported that they would be teaching the AP courses regardless of the incentives—indeed some had been teaching the courses for several years. Teachers did, however, indicate that the incentives were nice to have and a welcome added bonus for their participation.
- *Training*: If the number of students enrolling in AP courses continues to increase, there may be a need for more training in differentiated instruction (for students of varying ability levels).
- *School culture:* Some schools in the sample indicated they had already been encouraging students to take AP courses and so the culture shift or improvement would not likely be as marked as in schools with no existing AP program.

Below we briefly summarize the key findings from the student survey measure:

- Most students learned about AP and the CRP from their teachers or school counselors, and more than a third of students learned about the AP courses from other students.
- Ninety-five percent of student respondents (n = 877) indicated they planned to attend some sort of postsecondary institution.
- On a four-point scale (from 1= *not at all useful* to 4 = *extremely useful*) students on average rated the tutoring a 3.2 (SD = 0.71), which is an average rating of somewhat useful.
- Students attended an average of 2.02 in-person study sessions, which was lower than the expected average of six. Of the 822 students who responded, the average rating of usefulness of the student study sessions was 3.01 (SD = 0.80) on a four-point scale, which is an average rating of somewhat useful. On average, students had the lowest level of agreement that the in-person study sessions were conveniently scheduled, which sheds additional light on the issue of poor attendance.
- Students indicated their AP teachers had good content knowledge, and on average agreed with statements relating to their own confidence related to taking AP courses and exams.
- Most students surveyed indicated they were planning on taking the AP exam and two thirds indicated they were offered cash incentives for performance on AP exams.

On a four-point scale students rated the importance of the incentives an average of 2.98 (SD = 0.9) indicating the incentives (overall) were somewhat important.

A. Discussion

The impact findings for the first year of the independent evaluation of NMSI's i3 scale-up grant indicated a larger (although nonsignificant) percentage of students in the treatment schools taking at least one AP exam, compared to the control schools. In addition we found a higher percentage of students in the control schools achieved a 3 or higher on at least one AP exam (although again the difference was not significant). So ultimately, there were no differences between the two groups in terms of enrollment in AP and achievement on AP exams. As we were analyzing data from the first year of the CRP intervention it is perhaps not surprising we would not find a significant difference between the treatment and control schools. Students in the treatment schools may not have been exposed to a pipeline of high-quality STEM courses prior to participating in the CRP, and so they may not have had adequate time or opportunity to develop strong conceptual understanding of the material in their earlier coursework. Obtaining a qualifying score on an AP exam is challenging and perhaps even more so if the prerequisite knowledge is not present, or as strong as it could be. In addition, this study marked the first year teachers were implementing the CRP and attending the associated trainings. There is likely a learning curve for some teachers which may be reduced as they have more experience teaching

AP courses within the CRP. One of the goals of the CRP is to increase student enrollment in AP courses—particularly for students who may not typically see themselves as "AP students." While we did see some higher levels of student enrollment in the treatment schools, these differences were not significant and so we cannot read too much into these findings.

Data collected for the fidelity matrix indicated that not all elements of the CRP were implemented with high fidelity; however, overall results indicated that 23 schools (82.1%) achieved 80% or better implementation fidelity, for an average fidelity score of 89.3%. Seven schools achieved a perfect fidelity score of 100%. Looking at the different indicator groups (school supports, teacher supports, and student supports) we found that all school support measures across all schools were implemented with fidelity, with the caveat that complete data were only available for 16 schools (and incomplete data for 12 schools). So for the indicators on which we had data, all schools achieved above 80% fidelity in terms of school supports. Not all teachers were able to participate in all required training and so this teacher support component was not implemented with fidelity. Stipends and teacher awards were paid as expected as were student award payments.

Teacher survey data indicated teacher training was seen as the most effective component of the CRP related to student achievement and open enrollment the least effective. Teachers reported positive feedback on the training and indicated an increase in content knowledge. This suggests the CRP PD is meeting a need and helping prepare teachers to feel better equipped to teach AP courses. Teacher incentives were chosen as the least important program component relating to increasing student performance by 16% of teachers and student incentives by 12% of teachers. Teachers did, however, view the student incentives as an important program component to encourage student enrollment in AP courses. Likewise, students rated the financial incentives on average as somewhat important in encouraging them to participate in AP courses.

Student study sessions were viewed as important and positive components of the program. The AP courses cover a lot of content and the study sessions were seen as helpful for providing students' additional instructional time as well as additional pedagogical support and guidance for teachers. Many teachers mentioned in the interviews that the study sessions provided excellent resources for classroom use. This makes ensuring adequate and accurate data on student attendance an important goal for Year 2, as well as discussing possible alternatives to attending these sessions at the weekends, in person.

One of the goals of the CRP is to change school culture and to expand AP course access to traditionally underrepresented students. Teachers and administrators in some schools in the sample indicated they had already been encouraging students to take AP courses (prior to

implementation of the CRP) and so the culture shift or improvement would not likely be as marked as in schools with no prior AP program.

Evaluation of the CRP from the teacher and administrator perspective provides both unique insight as well as valuable support for the fidelity of implementation data we are gathering as part of our evaluation study. Perspectives of those on the ground who are implementing the CRP helps determine which factors are most important in creating and sustaining an accessible and successful AP program. Survey and interview data from CRP teachers across the country provided valuable support for data collected for the implementation evaluation and helped determine how CRP participants perceive the importance and efficacy of key program elements.

Findings presented in this report represent the first year of a multiyear evalution project designed to explore the impact of NMSI's CRP as well as evaluate the fidelity of implementation and examine factors associated with successful implementation. We are currently in the second year of our evaluation study and during the 2017–2018 school year will be collecting data from the treatment schools from Year 1, as well as the Year 1 delayed treatment schools who in Year 2 are receiving the treatment.

VII.References

ACT. (2016). The condition of college & career readiness 2016. Retrieved from http://www.act.org/content/dam/act/unsecured/documents/CCCR_National_2016.pdf

Bill & Melinda Gates Foundation. (2014). *Teachers know best: Teachers' views on professional development.* https://s3.amazonaws.com/edtech-production/reports/Gates-PDMarketResearch-Dec5.pdf

Chen, X. (2013). STEM Attrition: College Students' Paths Into and Out of STEM Fields (NCES 2014-001). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

Cross, I., Kilpatrick, C., & LaMonica, L. (2012). *Evaluation of the Advanced Placement Training and Incentives Program: Teachers' perspectives.* Williamsburg, VA: Thomas Jefferson Program in Public Policy at the College of William & Mary.

Dougherty, C., Mellor, L., & Jian, S. (2006). *The relationship between Advanced Placement and college graduation.* Austin, TX: National Center for Educational Accountability. Retrieved 1/17/17 from https://eric.ed.gov/?id=ED519365

Fleischman, H. L., Hopstock, P. J., Pelczar, M. P., & Shelley, B. E. (2010). *Highlights from PISA 2009: Performance of US 15-year-old students in reading, mathematics, and science literacy in an international context* (NCES 2011-004). National Center for Education Statistics.

Garet, M. S., Porter, A. C., Desimone, L., Birman, B. F., & Yoon, K. S. (2001). What makes professional development effective? Results from a national sample of teachers. *American Educational Research Journal, 38*(4), 915-945.

Geiser, S., & Santelices, V. (2004). *The role of Advanced Placement and honors courses in college admissions.* Berkeley, CA: Center for Studies in Higher Education, University of California, Berkeley.

Kena, G., Aud, S., Johnson, F., Wang, X., Zhang, J., Rathbun, A., Wilkinson-Flicker, S., and Kristapovich, P. (2014). *The Condition of Education 2014* (NCES 2014-083). U.S. Department of Education, National Center for Education Statistics. Washington, DC. Retrieved 1/5/18 from http://nces.ed.gov/pubsearch

National Science Board. (2010). *Science and engineering indicators 2010* (NSB 10-01). Arlington, VA: National Science Foundation.

Pew Research Center. (2017). *U.S. students' academic achievement still lags that of their peers in many other countries.* http://www.pewresearch.org/fact-tank/2017/02/15/u-s-students-internationally-math-science/

Raudenbush, S. W., & Sadoff, S. (2008). Statistical inference when classroom quality is measured with error. *Journal of Research on Educational Effectiveness, 1,* 138-154.

Scott, T. P., Tolson, H., & Lee, Y. H. (2010). Assessment of Advanced Placement participation and university academic success in the first semester: Controlling for selected high school academic abilities. *Journal of College Admission, 208,* 26-30.

Sherman, D., Darwin, M.J., Song, M., Li, Y., and Stachel, S. (2015, April 17). *First-Year impacts of the National Math and Science Initiative's Advanced Placement Training and Incentive Program on high school students' outcomes*. Paper presented at the 2015 annual meeting of the American Educational Research Association. Retrieved from the AERA Online Paper Repository.

Sherman, D., & Song, M. (2014). *Year 1 findings for APTIP impacts on students' AP performance in cohorts 1 and 2 schools.* Washington, DC: American Institutes for Research.

Sherman, D., & Song, M. (2015). *Year 2 findings for APTIP impacts on students' AP performance in cohorts 1 and 2 schools* (Memorandum for Gregg Fleischer, NMSI). Washington, DC: American Institutes for Research.

Appendix A: Connection to Logic Model

Table A1

Item Alignment to the Logic Model Component and Fidelity Matrix Construct

Logic Model Component	Question	Survey Item	Data Type/Analysis
Teacher Components (direct)			
Training	Do teachers perceive training to be effective in terms of increasing their content knowledge and improving instructional techniques?	Q24: e, f, h, i Q53: d, e **See Table 11**	Frequency (# of true ratings) Average ratings (3-point scale)
	Do teachers perceive attending the study sessions as effective in increasing content knowledge/efficacy as AP teacher?	Q36: g, h, i Q37: b	Average ratings (four-point scale)
Mentoring	Do teachers perceive mentoring as effective in increasing content knowledge/efficacy as AP teacher?	Q28: a, b, c, d	Average ratings (four-point scale)
Online Resources	Did teachers have access to online resources?	Q38	Number of teachers who selected option.
	How often did they access them?	Q46	Frequency (4 choices) + open ended
	How did teachers use the online resources?	Q47	Frequency (7 choices)
Incentives/Awards	How important were incentives in encouraging teaching AP?	Q45	Average rating
Overall	Overall which elements of the program were most effective for increasing enrollment (*school culture*)?	Q50	Frequency of most Frequency of least
	Overall which element of the program were most effective for increasing student performance in AP courses? (*student success*)	Q51	Frequency of most Frequency of least

Logic Model Component	Question	Survey Item	Data Type/Analysis
Teacher Perceptions of Student Components (indirect)			
Focused Study Sessions	Do teachers perceive attending the study sessions as effective in increasing student content knowledge and confidence?	Q36: d, f Q37: a Q53: a, b **-Incorporated into Table 13**	Average ratings (four-point scale) (3-point scale)
Equipment and supplies	Do teachers have the materials / equipment necessary to teach their courses effectively?	Q41 Q18: k **See Table 10**	Percent "yes" Average ratings (four-point scale)
Exam Fee Subsidies	N/A		
Student incentives (for exam performance)	N/A (except for Q50 and Q51 but we already have those included above)		
Overall/culture	Does the CRP effectively increase the participation of traditionally underrepresented populations? Is the CRP an effective way to increase student enrollment in AP courses?	Q49 Q52 Q53: c **See Table 11** Q20: c, f, h Q18: e, j, m, n **- Inserted in Table 16** Q23: d, e	Percent "yes" Average ratings (3-point scale) Frequency Average ratings (four-point scale)
Teacher Perceptions of School Components (indirect)			
Performance Analysis	N/A		
Access to Academic & Program Experts	In what ways did the CRP Program Manager help you to implement the CRP?	Q48	Free response—we can collapse categories of comments.

Logic Model Component	Question	Survey Item	Data Type/Analysis
Shared Goal Setting	Does the school exhibit a culture of continuous improvement?	Q12	Percent "yes"
		Q15 Q18: b, l **-Incorporated into Table 20**	Average ratings (four-point scale)
		Q23: b, c Q53: f **See Table 11**	Average ratings (3-point scale)
	Do students value STEM learning?	Q10: d, e	Average ratings (four-point scale)
	Do administrators value STEM learning?	Q18: d **See Table 10**	Average ratings (four-point scale)
		Q53: g **See Table 11**	Average ratings (3-point scale)

Appendix B: Teacher Survey Measure

CRP Participating Teachers Survey
Welcome to the AP Teacher Survey

Dear AP Teacher,

This survey is being conducted by the National Center on Research, Evaluation, Standards and Student Testing (CRESST) at UCLA as part of the implementation of the NMSI College Readiness Program (CRP) at your site.

CRESST is collecting survey data from samples of AP teachers, AP coordinators, and students taking AP courses in partner schools and non-partner schools in several states. The survey should take approximately 30 minutes to complete.

The purpose of the surveys is to understand the perspectives of these individuals on the implementation and impact of AP courses in their schools and, where appropriate, on the implementation of the College Readiness Program. It is not intended to evaluate your individual capabilities or performance. Responses will be analyzed to provide information about how AP courses are administered across the country.

We thank you for taking part in our survey. Your participation and feedback is very important. As a thank you for participating, upon completion of the survey you will receive a $50 gift card.

Please direct any questions about the project to Julia Phelan Ph.D (Julia.phelan@ucla.edu, 310-206-4998).

Thank you!

Teacher Background
Please consider your own personal experience when answering the following questions.

1. In which school do you currently teach? _____

2. Please select the one title that best describes your current position.
○ Classroom teacher (1-2 years teaching experience)
○ Classroom teacher (3 or more years teaching experience)
○ Out-of-classroom position such as instructional coach or district personnel
○ Special Education teacher
○ Other (please specify) _____

3. At which grade levels do you teach? (Please check all that apply.)
☐ 9
☐ 10
☐ 11
☐ 12
☐ Other (please specify) _____

4. To the nearest year, how long have you:
been a teacher? _____
been a teacher in your current school? _____
been a teacher in your current subject? _____
been a teacher in your current district? _____
been a teacher of AP courses? _____

5. In which content area(s) do you teach? (Please check all that apply.)
☐ Physical Science
☐ Earth Science
☐ Life science
☐ Chemistry
☐ Computer Science
☐ Calculus
☐ Algebra
☐ Trigonometry
☐ Integrated Mathematics
☐ Statistics
☐ English Language Arts
☐ Other (please specify) _____

6. Specifically in your AP classes, how many students do you have in each grade?

Grade 9 _____
Grade 10 _____
Grade 11 _____
Grade 12 _____

7. Which type of teaching credentials(s) do you hold? (Please check all that apply.)
☐ Clear Credential
☐ Preliminary Credential
☐ Emergency Credential
☐ Multiple Subjects
☐ Single Subject
☐ National Board Certification
☐ Currently in a program to obtain my teaching credential
☐ None
☐ Other (please specify) _____

8. In the past three years, have you participated in any of the following general professional development training opportunities? (Please check all that apply.)

☐ Subject-area content
☐ Pedagogy / instruction
☐ Subject-area curriculum
☐ Data analysis and using data to modify instruction
☐ Improving students' critical thinking or problem solving skills
☐ None
☐ Other (please specify) _____

9. How much do you agree or disagree with the following statements?	Strongly Agree	Agree Somewhat	Disagree Somewhat	Strongly Disagree
I have a strong sense of belonging to the community of educators.	○	○	○	○
I have a good understanding of the concepts I need to teach in my field.	○	○	○	○
I learn new ideas in my field quickly.	○	○	○	○
My students are usually pretty interested in learning their AP course content.	○	○	○	○
My students put in the effort it takes to learn in their AP course.	○	○	○	○

10. In which content area(s) are you teaching AP courses this year? (Please check all that apply.)

☐ Physics
☐ Earth Science
☐ Life science
☐ Chemistry
☐ Computer Science
☐ Calculus
☐ Statistics
☐ English Language and Composition
☐ English Literature and Composition
☐ Other (please specify) _____

11. Besides collaboration during Vertical Team meetings, do you collaborate with other AP math, science, and English teachers as part of your AP teaching (e.g., in a professional learning community [PLC] or in team meetings)? ["No" skips to item #15.]

○ Yes
○ No

Teacher Collaboration

12. Who typically leads these meetings?

○ AP coordinator
○ Administrator(s)
○ AP teacher(s)
○ Content Specialists
○ Leadership rotates among participants
○ Other (please specify) _____

13. What topics are typically addressed at these meetings? (Choose all that apply.)

☐ Subject specific content
☐ Pacing and/or sequencing information
☐ AP test preparation
☐ Data analysis and use to modify instruction
☐ Development of common assessments
☐ Other (please specify) _____

14. How would you describe the usefulness of the meetings?

☐ Extremely useful
☐ Useful
☐ Somewhat useful
☐ Not at all useful

Teaching Practices and Beliefs

15. Please indicate whether you agree/disagree with the following strategies as effective ways of strengthening your students' content understanding.	Strongly Agree	Agree Somewhat	Disagree Somewhat	Strongly Disagree
Teacher as "facilitator" or "coach".	○	○	○	○
Peer-to-peer problem solving.	○	○	○	○
Teacher asking students guiding questions.	○	○	○	○
Teacher providing time for students to persevere through solving complex problems.	○	○	○	○
Teacher demonstrating the correct way to solve a problem.	○	○	○	○
Teacher facilitating students' own inquiry.	○	○	○	○
Instruction built around problems with clear, correct answers, and around ideas that most students can grasp quickly.	○	○	○	○
How much students learn depends on how much background knowledge they have – that is why teaching facts is so necessary.	○	○	○	○
Thinking and reasoning processes are more important than specific curriculum content.	○	○	○	○
Teachers shouldn't let students develop answers that may be incorrect when they can just explain the answers more directly.	○	○	○	○
Students should be allowed to think of solutions to practical problems themselves before the teacher shows them how they are solved.	○	○	○	○

16. What supports (if any) are offered to you specifically as an AP math, science, or English teacher? (Choose all that apply.)

○ Additional planning time
○ Increased access to texts and other print resources
○ Increased access to Web-based resources
○ Increased access to technology
○ Additional professional development (PD) opportunities
○ Increased access to collaboration with other AP teachers
○ None
○ Other (please specify) _____

17. How much do you agree or disagree with the following statements?	Strongly Agree	Agree Somewhat	Disagree Somewhat	Strongly Disagree
The students in my school are well-prepared to take AP courses.	○	○	○	○
My school promotes a culture of continuous improvement.	○	○	○	○
My school offers too many AP courses.	○	○	○	○
My school leadership values STEM learning.	○	○	○	○
Many students who may do well in AP courses do not take them.	○	○	○	○
My school offers too few AP courses.	○	○	○	○
Students in AP courses in my school are well-prepared for the exam.	○	○	○	○
Students in AP courses in my school believe that they are well-prepared for the exam.	○	○	○	○
My school sets clear goals for AP instruction and exam performance.	○	○	○	○
My school sets goals for the number of students participating in AP courses and taking AP exams.	○	○	○	○
My school provides high quality instructional materials for teaching AP courses.	○	○	○	○
My school provides quality instruction on strategies and techniques for teaching AP courses.	○	○	○	○
My school encourages all students to enroll in AP courses.	○	○	○	○
My school considers all students — regardless of gender, ethnicity, or socioeconomic status — as capable of achieving at high levels.	○	○	○	○

18. Did your school offer AP courses in the 2015-2016 school year? ["No" skips to #20.]
○ Yes
○ No

AP Course History

19. Please select the most important reasons why qualified students in your school have not taken AP courses in the past? (Choose all that apply.)

☐ The students don't know about AP courses.
☐ My school has not previously offered enough courses.
☐ My school does not allow all interested students to enroll.
☐ Students can't afford to take the year-end exam.
☐ Students do not meet the requirements to enroll in AP classes.
☐ Student's don't realize that they are qualified.
☐ The courses have reputations as being too difficult.
☐ School administration and teachers do not perform enough outreach to promote AP courses.
☐ Other (please specify) _____

Required Goal Setting Meeting

20. Did your school hold a shared goal setting meeting in the fall to discuss targets for student performance and enrollment in AP courses? ["No" skips to #23.]

○ Yes
○ No

Goal Setting Meeting Attendance

21. Did you attend the shared goal setting meeting? ["No" skips to #23.]

○ Yes
○ No

Evaluation of Goal Setting Meeting

22. Please indicate how strongly you agree or disagree with the following statements about the shared goal setting meeting.	Strongly Agree	Agree Somewhat	Disagree Somewhat	Strongly Disagree
The meeting was effective	○	○	○	○
The meeting established measurable and attainable goals for class enrollment	○	○	○	○
The meeting established measurable and attainable goals for student exam performance	○	○	○	○
The meeting established goals for recruitment of high-need and traditionally underrepresented students into AP courses	○	○	○	○

Teacher Training Activities

23. Please indicate which of the following statements are true for each of the CRP teacher training activities listed. (Select all that apply.)	Four-Day AP Summer Institute (APSI)	Two-Day Fall Workshop	One-Day Spring Training
I attended the training	☐	☐	☐
I attended all days of the training	☐	☐	☐
The facilitators were knowledgeable and well-prepared	☐	☐	☐
The location suited the needs of the training activities	☐	☐	☐
The training activities improved my content knowledge	☐	☐	☐
At the end of the training, I felt more qualified to be an effective AP instructor	☐	☐	☐
The agenda and goals of the training activities were clear	☐	☐	☐
The training activities were effective	☐	☐	☐
The training helped me differentiate instruction for students at differing ability levels	☐	☐	☐

24. As part of the CRP, was Teacher Coaching or Mentoring made available to you? ["No" skips to #28.]
○ Yes
○ No

Teacher Mentoring Frequency

25. How often do you meet or communicate (virtually or in-person) with your assigned mentor? ["Not at all" skips to #28.]
○ Daily
○ Weekly
○ Monthly
○ Not at all
○ Other (please specify) _____

Teacher Coaching or Mentoring

26. What type of support did your mentor (CRP content specialist) provide?
☐ Modeling/demonstrating lessons
☐ Information on pacing and sequencing of lessons
☐ Help designing lessons or using course texts
☐ Advice on differentiating instruction for students at differing ability levels
☐ Direct instruction or tutoring with CRP students
☐ Other (please specify) _____

27. Please indicate how strongly you agree or disagree with the following statements about the CRP mentoring.	Strongly Agree	Agree Somewhat	Disagree Somewhat	Strongly Disagree
The mentor was knowledgeable and well-prepared	○	○	○	○
The mentoring improved my content knowledge	○	○	○	○
The mentoring honed my instructional skills and techniques	○	○	○	○
Because of the mentoring I am a more effective and qualified AP instructor	○	○	○	○
The mentoring sessions were conveniently scheduled	○	○	○	○
The mentor's guidance on pacing was helpful	○	○	○	○
I would like to have met more frequently with my mentor	○	○	○	○
My mentor did not have much time to meet with me	○	○	○	○

Tutoring Session Availability

28. As part of the CRP, does your school offer tutoring sessions (e.g., one-on-one or small group academic help) outside of AP class time (either within or outside of the school day)? ["No" skips to #31.]

○ Yes
○ No

Participation in Tutoring

29. How are students identified for tutoring? (Choose all that apply.)

☐ Scores on classroom assessments
☐ Classroom performance
☐ Scores on standardized or other large-scale tests
☐ Other academic criterion
☐ Other data, such as behavioral and/or attendance
☐ Referrals from other teachers or school staff
☐ Self-identified (i.e. students volunteer to attend)
☐ Other (please specify) _____

30. Approximately, how many of your AP students typically attend tutoring sessions?

○ 75% - 100%
○ 50% - 74%
○ 25% - 49%
○ < 25%
○ None

Instructional Supports

31. In general, to what extent do you encourage students to attend student study sessions?

○ To a great extent
○ To a moderate extent
○ To a small extent
○ Not at all

32. How many student study sessions did you attend this year?

○ 5 or more
○ 3 or 4
○ 1 or 2
○ None

33. Students are required to attend at least three student study sessions outside of the regular school day. Approximately what percentage of your AP students satisfied this requirement?

○ 75% - 100%
○ 50% - 74%
○ 25% - 49%
○ < 25%
○ None

34. Please indicate the type of study sessions attended by your students.	75-100%	50-74%	25-49%	<25%
Saturday, in-person study sessions	○	○	○	○
Online study sessions	○	○	○	○

35. Please indicate the extent to which you agree or disagree with each of the following statements about the student study sessions.	Strongly Agree	Agree Somewhat	Disagree Somewhat	Strongly Disagree
My input was considered when determining the study session topics	○	○	○	○
Students were active participants (e.g., answering and asking questions, focused on tasks assigned, etc.)	○	○	○	○
The study sessions were conveniently scheduled to accommodate student schedules	○	○	○	○
The study sessions improved students' content knowledge	○	○	○	○
The study sessions were led by AP experts who taught NMSI-created lessons	○	○	○	○
The study sessions helped to increase student confidence	○	○	○	○
The study sessions highlighted the instructional needs of the students for me to continue addressing in class	○	○	○	○
I learned a great deal from watching the expert teachers during the student study sessions	○	○	○	○
I was able to take the strategies I saw employed during the study sessions back to my own classrooms to improve student achievement	○	○	○	○

36. Please answer the following questions about how useful the student study sessions have been.	Extremely Useful	Useful	Somewhat Useful	Not at All Useful
In general, how would you describe the usefulness of the student study sessions for students?	○	○	○	○
In general, how useful are the student study sessions for you?	○	○	○	○
How useful was it to include an online student study session as well as in-person sessions?	○	○	○	○

37. In addition to regular classroom materials, what instructional resources are offered for use specifically in your AP math, science, or English class? (Choose all that apply.)
☐ Supplementary texts to the core curricular materials
☐ Relevant articles and/or monographs
☐ College Board AP curricular materials
☐ Access to online resources
☐ Technology
☐ Access to field experiences for AP students (e.g., meeting with local government leaders, conducting water quality tests at local stream)
☐ Do not know
☐ None
☐ Other (please specify) _____

38. What assessments does CRP offer specifically for your AP math, science, or English class? (Choose all that apply.)
☐ Frequent classroom short assessments to monitor student progress
☐ AP-level multiple-choice-item guides
☐ AP-level essay prompts
☐ Practice AP tests
☐ Scoring standards and/or rubrics
☐ Unit tests
☐ Do not know
☐ None
☐ Other (please specify) _____

39. What equipment does CRP offer for use specifically in your AP math, science, or English class? (Choose all that apply.)
☐ Smartboard or other presentation device
☐ Lab or classroom supplies
☐ Student review materials
☐ Additional computer hardware, such as printers and scanners
☐ Do not know
☐ None
☐ Other (please specify) _____

40. Do you have the materials/equipment you need to teach your course effectively?
○ Yes
○ No

Teacher Incentives Availability
41. Were incentives (financial or otherwise) offered to you as an AP math, science, or English teacher? ["No" skips to #45.]
○ Yes
○ No

Teacher Incentives in Practice

42. What incentives were offered to you as an AP math, science, or English teacher? (Choose all that apply.)

☐ Financial incentives
☐ Additional PD opportunities
☐ Recertification points
☐ Leadership position on school PLC or other team
☐ Other (please specify) _____

43. For what milestones or achievements were incentives offered? (Choose all that apply.)

☐ Total number of students enrolling in an AP course
☐ Total number of students completing and passing an AP course (score of 3 or above)
☐ Total number of students taking AP exams
☐ Student participation in additional study work (e.g., tutoring and weekend sessions)
☐ Attendance at certain training sessions or other similar events
☐ Serving in a leadership role on PLCs or other school committees
☐ Do not know
☐ Other (please specify) _____

44. How important were these incentives in encouraging your teaching of AP math, science, or English classes? (Choose one.)

○ Extremely important
○ Important
○ Somewhat important
○ Not at all important

Accessing Online Resources

45. As part of the CRP, online instructional materials are available to teachers via NMSITeachers.org. How often do you access the CRP online instructional materials? ["No" skips to #47.]

○ Daily
○ Weekly
○ Monthly
○ Not at all
○ Other (please specify) _____

Using Online Resources

46. How did you use instructional materials on NMSITeachers.org? (Select all that apply.)

☐ To assess student progress
☐ To familiarize students with the types of questions on the AP exam
☐ To deepen the instruction in particular content areas
☐ To teach test taking strategies
☐ To prepare for upcoming student study sessions
☐ To conduct a practice AP exam
☐ To review the materials covered in the teacher training sessions

47. In what ways did the CRP Program Manager help you to implement the CRP? [Free response]

48. Do you feel that the CRP is an effective way to increase student enrollment in AP courses?
○ Yes
○ No
Additional comments: _____

49. Which elements of the CRP were most/least effective at increasing student enrollment in AP courses?	Open Enrollment	Teacher Training	Student Financial Awards	Teacher Incentives
Most effective	○	○	○	○
Least effective	○	○	○	○

50. Which elements of the CRP were most/least effective at increasing student performance in AP courses and on AP exams?	Open Enrollment	Teacher Training	Student Financial Awards	Teacher Incentives	Student Study Sessions	Online Instructional Resources
Most effective	○	○	○	○	○	○
Least effective	○	○	○	○	○	○

51. Overall, has opening up enrollment to all students had a positive impact on the AP program?
○ Yes
○ No

52. Indicate whether the CRP contributed to improving the following:	Major Improvement	Slight Improvement	No Improvement
Students' content knowledge	○	○	○
Students' experience with STEM AP courses	○	○	○
Recruitment of high-need and traditionally underrepresented students into AP courses	○	○	○
Teachers' content knowledge	○	○	○
Teachers' instructional skills, techniques and strategies	○	○	○
School culture of continuous improvement	○	○	○
School leadership valuing STEM learning	○	○	○

53. If you feel there were factors which significantly helped or impeded your ability to successfully implement the College Readiness Program, please describe them below.
_____

The survey is complete! Thank you for participating--we appreciate your time and your expert feedback.

Appendix C: Administrator Survey Measure

CRP Administrator Survey
Welcome to the CRP/NMSI Administrator Survey

Dear School Administrator,

This survey is being conducted by the National Center on Research, Evaluation, Standards and Student Testing (CRESST) at UCLA as part of the implementation of the NMSI College Readiness Program (CRP) at your site.

CRESST is collecting survey data from samples of AP teachers, AP coordinators, and students taking AP courses in partner schools and non-partner schools in several states. The survey should take 20-25 minutes to complete.

The purpose of the surveys is to understand the perspectives of these individuals on the implementation and impact of AP courses in their schools and, where appropriate, on the implementation of the College Readiness Program. It is not intended to evaluate your individual capabilities or performance. Responses will be analyzed to provide information about how AP courses are administered across the country.

We thank you for taking part in our survey. Your participation and feedback is very important.

Please direct any questions about the project to Julia Phelan, Ph.D. (julia.phelan@ucla.edu, 310-206-4998).

Thank you!

AP in Your School
1. For which school are you the designated CRP Administrator?

2. How many years have you been coordinating Advanced Placement (AP) courses at your current school? (If this is your first year, please select "One year.") (Choose one.)
☐ One year
☐ Two to four years
☐ Five years or more
☐ Not applicable (please specify) _____

3. What supports (if any) are offered to AP math, science, or English teachers? (Choose all that apply.)
○ Additional planning time
○ Increased access to texts and other print resources
○ Increased access to Web-based resources
○ Increased access to technology
○ Additional professional development (PD) opportunities
○ Increased access to collaboration with other AP teachers
○ None
○ Other (please specify) _____

4. Did your school hold a shared goal setting meeting in the fall to discuss targets for student performance and enrollment in AP courses? ["No" skips to #7.]
○ Yes
○ No

Goal Setting Meeting Attendence
5. Did you attend the shared goal setting meeting? ["No" skips to #7.]
○ Yes
○ No

Evaluation of Goal Setting Meeting

6. Please indicate how strongly you agree or disagree with the following statements about the shared goal setting meeting.	Strongly Agree	Agree Somewhat	Disagree Somewhat	Strongly Disagree
The meeting was effective	○	○	○	○
The meeting established measurable and attainable goals for class enrollment	○	○	○	○
The meeting established measurable and attainable goals for student exam performance	○	○	○	○
The meeting established goals for recruitment of high-need and traditionally underrepresented students into AP courses.	○	○	○	○
The meeting established goals for providing equitable access to AP coursework for all interested students.	○	○	○	○

Program Coordination
This section asks about how you coordinate the administration of the College Readiness Program. Please keep in mind that these items ask specifically about activities related to CRP, and not similar activities you may conduct as part of your work with other programs.

7. What specific materials and resources have you provided or obtained for the CRP this year? (Choose all that apply.)
○ Core and/or supplemental texts
○ Other literature (either digital or print resources)
○ Technology
○ Lab equipment
○ Other (please specify) _____

8. How do you support the coordination of the CRP classes? (Choose all that apply.)
○ Designing the AP course schedule
○ Assigning teachers to AP courses
○ Enrolling students in AP classes
○ Leading and/or assisting with tutoring or other direct instruction
○ Leading and/or assisting with AP exam preparation
○ Other (please specify) _____

9. How do you support the administration of AP exams? (Choose all that apply.)
○ Ordering and/or distributing exams
○ Ensuring exams are administered according to College Board requirements
○ Proctoring test administration
○ Tracking and ensuring waiving of exam fees (when appropriate)
○ Other (please specify) _____

10. To what extent do you support and advocate for the CRP in the following activities?	To a Great Extent	To a Moderate Extent	To a Small Extent	Not at All
Participating in school AP fairs	○	○	○	○
Meeting directly with students and parents	○	○	○	○
Conducting promotional activities with the state, district, or other external entities	○	○	○	○

Program Oversight
This section asks about your role working with the CRP teachers and students. Again, these items ask specifically about this work as it relates to CRP, not other activities around which you may interact with these individuals.

11. To what extent do you provide program oversight in the following activities to ensure teachers are adhering to the College Board content-specific curriculum?	To a Great Extent	To a Moderate Extent	To a Small Extent	Not at All
Analysis of student data (including AP exam scores)	○	○	○	○
Classroom observations	○	○	○	○
Teacher-developed reports	○	○	○	○
Review of teacher portfolios	○	○	○	○

12. How have your activities related to AP coordination changed since the implementation of the CRP? (Choose all that apply. Please specify.)
Provided new or different materials _____
Performed new or different tasks to coordinate AP classes _____
Performed new or different tasks to coordinate AP exams _____
Performed new or different tasks to support and promote the CRP _____
Utilized new/different strategies to provide program oversight of adherence to the College Board curriculum _____
Utilized new/different strategies to provide program oversight of support to students _____
Other _____
No changes (Please enter "no" in the text box.) _____

13. To what extent do you provide program oversight in the following activities to ensure students are receiving the support they need to succeed in CRP classes?	To a Great Extent	To a Moderate Extent	To a Small Extent	Not at All
Analysis of student data (including AP exam scores)	○	○	○	○
Classroom observations	○	○	○	○
Conferences with CRP teachers	○	○	○	○
Conferences with parents	○	○	○	○
Conferences with students	○	○	○	○

Instructional Supports
14. As part of the CRP, were students offered exam fee subsidies or other financial awards?
○ Yes
○ No

15. In addition to regular classroom materials, what instructional resources are offered to teachers for use specifically in their AP math, science, or English class? (Choose all that apply.)
☐ Supplementary texts to the core curricular materials
☐ Relevant articles and/or monographs
☐ College Board AP curricular materials
☐ Access to online resources
☐ Technology
☐ Access to field experiences for AP students (e.g., meeting with local government leaders, conducting water quality tests at local stream)
☐ Do not know
☐ None
☐ Other (please specify) _____

16. Do teachers have the materials/equipment they need to teach their courses effectively?
○ Yes
○ No

17. Were you offered financial incentives as the CRP administrator? ["No" skips to #22.]
○ Yes
○ No

Administrator Incentives in Practice
18. For what milestones or achievements are incentives offered? (Choose all that apply.)
☐ Total number of students enrolling in an AP course
☐ Total number of students completing and passing an AP course
☐ Total number of students taking AP exams
☐ Student participation in additional study work (e.g., tutoring and weekend sessions)
☐ Attendance at certain training sessions or other similar events
☐ Serving in a leadership role on PLCs or other school committees
☐ Do not know
☐ Other (please specify) _____

19. How important are these incentives in encouraging your participation in the CRP? (Choose one.)
○ Extremely important
○ Important
○ Somewhat important
○ Not at all important

2015-2016 AP Courses
20. Did your school offer AP classes in the 2015-2016 school year? ["No" skips to #22.]
○ Yes
○ No

AP Course History

21. Please select the most important reasons why qualified students in your school have not taken AP courses in the past? (Choose all that apply.)

○ The students don't know about AP courses.
○ Our school has not previously offered enough courses.
○ Our school does not allow all interested students to enroll.
○ Students can't afford to take the year-end exam.
○ Students do not meet the requirements to enroll in AP classes.
○ Student's don't realize that they are qualified.
○ The courses have reputations as being too difficult.
○ We have not performed enough outreach to promote AP courses.
○ Other (please specify) _____

CRP Administration

22. Did CRP Program Managers provide sufficient support coordinating each of the following?	Yes	No
Delivery of student study session reminders and materials	○	○
Assistance in teacher sign-ups for summer trainings, two-day trainings, student study sessions	○	○
Assignment of mentor teachers	○	○
Guidance and direction concerning NMSI provided curricular support materials	○	○

23. Do you feel that the CRP is an effective way to increase enrollment in AP courses?

○ Yes
○ No

Additional comments _____

24. Which elements of the CRP were most/least effective at increasing student enrollment in AP courses?	Open Enrollment	Teacher Training	Student Financial Awards	Teacher Incentives
Most effective	○	○	○	○
Least effective	○	○	○	○

25. What elements of the CRP were most/least effective at improving student performance in AP courses and on AP exams?	Open Enrollment	Teacher Training	Student Financial Awards	Teacher Incentives	Student Study Sessions	Online Instructional Resources
Most effective	○	○	○	○	○	○
Least effective	○	○	○	○	○	○

26. Overall, has opening up enrollment to all students had a positive impact on the AP program?

○ Yes

○ No

27. Indicate whether the CRP contributed to improving the following:	Major Improvement	Slight Improvement	No Improvement
Students' content knowledge	○	○	○
Students experience with STEM AP courses	○	○	○
Recruitment of high-need and traditionally underrepresented students into AP courses	○	○	○
Teachers' content knowledge	○	○	○
Teachers' instructional skills, techniques and strategies	○	○	○
School culture of continuous improvement	○	○	○
School leadership valuing STEM learning	○	○	○

28. If you feel there were factors which significantly helped or impeded your ability to successfully implement the College Readiness Program, please describe them below.

_____

The survey is complete! Thank you for participating - we appreciate your time and your expert feedback.

Appendix D: Student Survey Measure

CRP Study: AP Student Survey

Directions: Please write-in your response or circle the letter that best fits your answer.

1. What school do you attend? _____

2. How many AP math, science, and English courses have you taken in high school including the courses in which you are currently enrolled? _____

3. Please indicate which AP course(s) are you currently taking?

Course Name	
English Language and Composition	☐
English Literature and Composition	☐
Calculus	☐
Computer Science	☐
Statistics	☐
Biology	☐
Chemistry	☐
Environmental Science	☐
Physics	☐

4. How did you learn about the AP courses available at your school? (Choose all that apply.)

☐ My AP teacher(s)
☐ Other teacher(s) in the school
☐ A school counselor
☐ Other student(s)
☐ School signs, emails or fliers
☐ People outside of the school (e.g., private tutor, teachers from other schools)
Please specify (roles, not names): _____
☐ Other
Please specify (roles, not names): _____

5. How did you learn about the College Readiness Program? (Choose all that apply.)
☐ My AP teacher(s)
☐ Other teacher(s) in the school
☐ A school counselor
☐ Other student(s)
☐ School signs, emails or fliers
☐ People outside of the school (e.g., private tutor, teachers from other schools)
Please specify (roles, not names): _____
☐ Other
Please specify (roles, not names): _____

6. What is the highest level of education you plan to complete? (Choose one.)
○ High school
○ Career/technical school
○ 2 year community/junior college
○ 4 year college or university
○ Graduate school – MD/PhD/MA/MBA

Student Supports

This section asks you about any supports available to you as an AP student to help you successfully complete AP math, science, and English courses for this school year.

Tutoring

We will start by asking about any tutoring supports (e.g., one-on-one or small group academic help) you receive. These tutoring supports do <u>not</u> refer to online and weekend Study Sessions. We will ask you about Study Sessions later in the survey.

7. Are tutoring sessions, either during or outside of the school day, offered for any of your AP math, science, or English classes? (Choose one.)
○ Yes
○ No (Skip to item 14.)

8. Who *typically* provides these tutoring sessions? (Choose all that apply.)
☐ My AP teacher(s)
☐ Other teacher(s) in the school
☐ Other student(s)
☐ People outside of the school (e.g., private tutor, teachers from other schools)
Please specify (roles, not names): _____
☐ Other
Please specify (roles, not names): _____

9. How did you learn about the tutoring sessions? (Choose all that apply.)
☐ My AP teacher(s)
☐ Other teacher(s) in the school
☐ A school counselor
☐ Other student(s)
☐ School signs, emails or fliers
☐ People outside of the school (e.g., private tutor, teachers from other schools)
Please specify (roles, not names): _____
☐ Other
Please specify (roles, not names): _____

10. How often do you attend any tutoring sessions for your AP math, science, or English courses? (Choose one.)
○ More than once each week
○ About once each week
○ About once each month
○ Less than once each month
○ Never (Skip to item 14.)

11. Did you have the same tutor for each session in a subject? (Choose one.)
○ Yes
○ No

12. In general, how would you describe the usefulness of these tutoring sessions? (Choose one.)

○ Extremely useful
○ Somewhat useful
○ Slightly useful
○ Not at all useful

13. Please indicate how strongly you agree or disagree with each of the following statements:	**Strongly Agree**	**Agree Somewhat**	**Disagree Somewhat**	**Strongly Disagree**
My AP tutors understand the content they are teaching	○	○	○	○
The tutoring improved my performance in the AP course	○	○	○	○
The AP tutors worked on my specific needs during the sessions	○	○	○	○
The tutoring sessions increase my confidence in my ability to successfully take the AP exams	○	○	○	○
It was easy to schedule AP tutoring sessions	○	○	○	○

AP Study Sessions
Now, we will ask you about the supports offered in Study Sessions.

14. Please write in the number of Study Sessions you completed online and attended in person for each of the following AP classes you are taking.	**In-person Study Sessions Attended**	**Online Study Sessions**
English Language and Composition		
English Literature and Composition		
Calculus		
Computer Science		
Statistics		
Biology		
Chemistry		
Environmental Science		
Physics		

15. How did you learn about the Study Sessions? (Choose all that apply.)
☐ My AP teacher(s)
☐ Other teacher(s) in the school
☐ A school counselor
☐ Other student(s)
☐ School signs, emails or fliers
☐ People outside of the school (e.g., private tutor, teachers from other schools)
☐ Other
Please specify (roles, not names): _____

16. Did you attend any in-person Study Sessions? (Choose one.)
○ Yes
○ No (Skip to item 19.)

17. Did you have the same instructor at each in-person Study Session for a subject? (Choose one.)
○ Yes
○ No

18. In general, how would you describe the usefulness of Study Sessions? (Choose one.)
○ Extremely useful
○ Somewhat useful
○ Slightly useful
○ Not at all useful

19. Please indicate how strongly you agree or disagree with each of the following statements about the science AP class you are taking (if any):

Name of science AP course: _____	**Strongly Agree**	**Agree Somewhat**	**Disagree Somewhat**	**Strongly Disagree**
The Study Sessions increased my confidence in my ability to successfully complete AP courses	○	○	○	○
The Study Sessions improved my understanding of the course content	○	○	○	○
The in-person Study Sessions were conveniently scheduled	○	○	○	○
The Study Sessions increased my confidence in my ability to successfully take the AP exams	○	○	○	○
The Study Sessions improved my test taking strategies	○	○	○	○

20. Please indicate how strongly you agree or disagree with each of the following statements about the math AP class you are taking (if any):

Name of math AP course: _____	**Strongly Agree**	**Agree Somewhat**	**Disagree Somewhat**	**Strongly Disagree**
The Study Sessions increased my confidence in my ability to successfully complete AP courses	○	○	○	○
The Study Sessions improved my understanding of the course content	○	○	○	○
The in-person Study Sessions were conveniently scheduled	○	○	○	○
The Study Sessions increased my confidence in my ability to successfully take the AP exams	○	○	○	○
The Study Sessions improved my test taking strategies	○	○	○	○

21. Please indicate how strongly you agree or disagree with each of the following statements about the English AP class you are taking (if any):

Name of English AP course: _____	**Strongly Agree**	**Agree Somewhat**	**Disagree Somewhat**	**Strongly Disagree**
The Study Sessions increased my confidence in my ability to successfully complete AP courses	○	○	○	○
The Study Sessions improved my understanding of the course content	○	○	○	○
The in-person Study Sessions were conveniently scheduled	○	○	○	○
The Study Sessions increased my confidence in my ability to successfully take the AP exams	○	○	○	○
The Study Sessions improved my test taking strategies	○	○	○	○

Student Preparation

In this section, we want to know how you feel about your own preparation for the AP exams.

22. Please indicate how strongly you agree or disagree with each of the following statements:

	Strongly Agree	Agree Somewhat	Disagree Somewhat	Strongly Disagree
My AP teachers understand the content they are teaching	○	○	○	○
The support the school provides outside of the classroom improved my study skills	○	○	○	○
I am confident in my ability to successfully complete AP courses	○	○	○	○
I am confident in my ability to successfully take AP exams	○	○	○	○
The support the school provides outside of the classroom increased my understanding of the course content	○	○	○	○
I was nervous about how hard the AP courses would be when I signed up for them	○	○	○	○
I am confident in my ability to learn new STEM content	○	○	○	○
The support the school provides outside of the classroom improved my test taking strategies	○	○	○	○

23. Are you planning to take the AP exams for all of your math, science and English AP courses?

○ Yes (Skip to item 28.)

○ No

24. If you are NOT planning to take your **science** AP exam, please indicate whether the following statements are true or false.

Name of science AP course:

_____

	T	F
I don't see any benefit in taking AP exams.	☐	☐
I am not ready to take my science AP exam.	☐	☐
I can afford to take the science exam.	☐	☐
I am taking too many AP exams.	☐	☐
My course load is too heavy to prepare for another test.	☐	☐
The college I'm going to doesn't accept AP scores.	☐	☐
The cost of all of my AP exams is too much.	☐	☐

25. If you are NOT planning to take your **math** AP exam, please indicate whether the following statements are true or false.

Name of math AP course:

_____

	T	F
I don't see any benefit in taking AP exams.	☐	☐
I am not ready to take my math AP exam.	☐	☐
I can afford to take the math exam.	☐	☐
I am taking too many AP exams.	☐	☐
My course load is too heavy to prepare for another test.	☐	☐
The college I'm going to doesn't accept AP scores.	☐	☐
The cost of all of my AP exams is too much.	☐	☐

26. If you are NOT planning to take your **English** AP exam, please indicate whether the following statements are true or false.

Name of English AP course:

_____

	T	F
I don't see any benefit in taking AP exams.	☐	☐
I am not ready to take my English AP exam.	☐	☐
I can afford to take the English exam.	☐	☐
I am taking too many AP exams.	☐	☐
My course load is too heavy to prepare for another test.	☐	☐
The college I'm going to doesn't accept AP scores.	☐	☐
The cost of all of my AP exams is too much.	☐	☐

Awards

In this section, we want to know how students can earn rewards for successful enrollment and completion of AP math, science, and English courses for this school year. Please note that we are asking about *all* the rewards that have been offered, whether or not you have received them.

27. What are the rewards offered to encourage you to participate in AP math, science, and English courses? (Choose all that apply.)
☐ Scholarship incentives
☐ Cash rewards
☐ Prizes (e.g., classroom prizes, door prizes)
☐ Weighted grades (e.g., 0.5 points additional for AP courses)
☐ AP course exam fee is waived or supplemented
☐ Other
Please Specify: _____
☐ None (Skip to end of survey.)

28. How can students earn rewards? (Choose all that apply.)
☐ Enrolling in an AP math, science, or English course
☐ Completing and passing an AP math, science, or English course
☐ Taking the AP exam
☐ Passing the AP exam
☐ Completing a certain number of AP-related tasks (such as online Study Sessions)
Other
☐ Please Specify: _____

29. How important are these rewards in encouraging you to participate in AP math, science, and English classes? (Choose one.)
○ Extremely important
○ Somewhat important
○ Slightly important
○ Not at all important

30. Have you received your awards (if any) in a timely manner? (Choose one.)
○ Yes
○ No

You are finished with the survey. Thank you for participating!

Appendix E: Teacher Interview Questions

AP Teacher Interview

To the interviewee: Thank you again for taking the time to talk with me today. This interview is expected to take about 30-45 minutes. We will focus on your thoughts on important components of the CRP, effects of CRP on school culture, and relative effectiveness of elements of the CRP on student success and interest in AP.

If it is ok with you, I would like to record this interview. This recording would only be used to ensure that I capture your responses completely and accurately, and would not be accessible to anyone outside our research team. In addition, your name will not be linked with any response you give in any public reporting. However, based on your role, it might be possible to determine your identity, so we cannot guarantee complete anonymity in reporting. Do I have your permission to record this interview with you?

[Note to interviewer: If the respondent does not want to be recorded, take notes, but do not proceed with recording. If the respondent agrees to be recorded, start the recording and repeat the question so that the positive response to this question and subsequent responses are recorded.]

a. What were the most effective or important parts of the CRP?

b. How has school culture changed since the implementation of CRP?

c. Are you satisfied with the level of training and support you have received throughout the school year?

d. Did you attend the student study sessions?

    a. If yes, were they helpful to you? Please describe.

e. Was mentoring offered to you as part of the CRP?

    a. If yes, did you take advantage of it?
    b. Was it beneficial to you?

f. Do you feel adequately prepared to teach your AP course?

g. What supports (e.g., increased planning time, additional PD, increased access to collaboration etc.) were offered to you specifically as an AP teacher?

h. Were incentives offered to you as an AP teacher?

    a. If yes, please describe

i. For what milestones or achievements were incentives offered?

j. How important were these incentives in encouraging your teaching of AP classes?

k. Do you think that the monetary incentives offered to students have increased interest and enrollment in AP courses at your school?

l. Would you change anything about the CRP to improve AP education in your school?

Appendix F: Administrator Interview Questions

School Administrator Interview

To the interviewee: Thank you again for taking the time to talk with me today. This interview is expected to take about 30-45 minutes. We will focus on your thoughts on important components of the CRP, effects of the CRP on school culture, and relative effectiveness of elements of the CRP on student success and interest in AP.

If it is ok with you, I would like to record this interview. This recording would only be used to ensure that I capture your responses completely and accurately, and would not be accessible to anyone outside our research team. In addition, your name will not be linked with any response you give in any public reporting. However, based on your role, it might be possible to determine your identity, so we cannot guarantee complete anonymity in reporting. Do I have your permission to record this interview with you?

[Note to interviewer: If the respondent does not want to be recorded, take notes, but do not proceed with recording. If the respondent agrees to be recorded, start the recording and repeat the question so that the positive response to this question and subsequent responses are recorded.]

a. What were the most effective or important parts of the CRP?

b. How has school culture changed since the implementation of CRP?

c. Did you attend a CRP-related goal setting meeting at your school?

    a. If yes, was the meeting an effective way to establish expectations for the program?
    b. What would you do differently?

d. Did your school receive funds through the CRP for new equipment and materials?

    a. If yes, please describe how the materials impacted instruction

e. Were incentives offered to you as the CRP Designated Administrator?

    a. If yes, please describe
    b. For what milestones or achievements were incentives offered?

f. Do you think that the monetary incentives offered to students have increased interest and enrollment in AP courses at your school?

g. Do you perform classroom observations?

    a. If yes, how does CRP classroom instruction and participation compare to non-CRP classes?

h. Would you change anything about the CRP to improve AP education in your school?

Appendix G: Student Survey Data

Statement	Biology	Chemistry	Env Science	Physics	Science overall
The study sessions increased my confidence	3.14 (0.72)	3.02 (0.87)	3.18 (0.69)	2.91 (0.82)	3.02 (0.79)
Improved my content understanding	3.11 (0.78)	3.00 (0.87)	3.26 (0.69)	2.98 (0.81)	3.05 (0.80)
Conveniently scheduled	2.83 (0.85)	2.86 (0.97)	3.18 (0.72)	2.88 (0.92)	2.88 (0.89)
Increased my confidence in my ability to take the AP exams	3.09 (0.80)	2.91 (0.93)	3.20 (0.76)	2.85 (0.86)	2.97 (0.85)
Improved my test-taking strategies	2.99 (0.89)	2.85 (0.92)	3.10 (0.74)	2.86 (0.88)	2.93 (0.87)

Statement	Calculus	Computer Science	Statistics	Math overall
The study sessions increased my confidence	3.24 (0.80)	3.02 (0.64)	3.11 (0.74)	3.16 (0.77)
Improved my content understanding	3.23 (0.68)	3.09 (0.76)	3.15 (0.68)	3.18 (0.69)
Conveniently scheduled	3.07 (0.83)	2.63 (0.95)	2.96 (0.85)	2.97 (0.86)
Increased my confidence in my ability to take the AP exams	3.18 (0.77)	2.89 (0.71)	3.03 (0.81)	3.09 (0.78)
Improved my test-taking strategies	3.14 (0.77)	2.91 (0.86)	3.01 (0.82)	3.06 (0.81)

Statement	English Language	English Literature	English overall
The study sessions increased my confidence	3.15 (0.73)	3.13 (0.76)	3.14 (0.73)
Improved my content understanding	3.18 (0.73)	3.13 (0.69)	3.16 (0.72)
Conveniently scheduled	3.00 (0.89)	2.95 (0.81)	2.98 (0.87)
Increased my confidence in my ability to take the AP exams	3.10 (0.77)	3.07 (0.71)	3.09 (0.76)
Improved my test-taking strategies	3.17 (0.78)	3.07 (0.73)	3.14 (0.77)

Appendix H: Distribution of Teacher Survey Respondents by State, District, and School

State	District	School	*n*	%	Cumulative *n*	Cumulative %
CA	CA district	CA school 1	3	2.33	3	2.33
		CA school 2	5	3.88	8	6.2
GA	GA district	GA school 1	6	4.65	14	10.85
		GA school 2	5	3.88	19	14.73
IL	IL district	IL school 1	2	1.55	21	16.28
		IL school 2	3	2.33	24	18.6
		IL school 3	4	3.1	28	21.71
LA	LA district	LA school 1	7	5.43	35	27.13
MI	MI district	MI school 1	9	6.98	44	34.11
		MI school 2	7	5.43	51	39.53
MO	MO district	MO school 2	4	3.1	55	42.64
		MO school 1	4	3.1	59	45.74
		MO school 3	7	5.43	66	51.16
ND	ND district 1	ND school 1	4	3.1	70	54.26
	ND district 2	ND school 2	8	6.2	78	60.47
		ND school 3	5	3.88	83	64.34
OH	OH district	OH school 2	1	0.78	84	65.12
		OH school 1	2	1.55	86	66.67
		OH school 3	3	2.33	89	68.99
		OH school 4	2	1.55	91	70.54
PA	PA district 1	PA school 1	4	3.1	95	73.64
	PA district 2	PA school 2	8	6.2	103	79.84
	PA district 3	PA school 3	7	5.43	110	85.27
TX	TX district	TX school 3	2	1.55	112	86.82
		TX school 1	1	0.78	113	87.6
		TX school 4	4	3.1	117	90.7
		TX school 2	6	4.65	123	95.35
		TX school 5	6	4.65	129	100