National Math and Science Initiative

College Readiness Program (CRP)

DID CRP IMPROVE STUDENTS' ADVANCED PLACEMENT OUTCOMES?

Project Overview

THE PROBLEM: What Challenge Did the Program Try to Address?

The U.S. government estimates that by 2022, about one million STEM-related jobs will be added to the economy and overall employment in STEM professions will grow by about 13%.[1] Unfortunately, U.S. high school students are often unprepared for postsecondary study in STEM, hindering their ability to take advantage of these employment opportunities. One solution to this issue is to provide high school students with STEM coursework that is equivalent to what's taught in college. To that end, National Math and Science Initiative (NMSI) applied for and received an i3 validation grant[2] (2012-2017) to implement and evaluate its College Readiness Program in 58 high schools across Colorado and Indiana over a three-year period.

THE PROJECT: What Strategies Did the Program Employ?

NMSI's College Readiness Program (CRP) promotes STEM education in high schools by seeking to increase the number of students taking Advanced Placement (AP) courses in STEM-related subjects and receiving AP exam scores equivalent to college coursework. To achieve this goal, it provides teachers, students, and schools with supports to boost students' success in math, science, and English AP courses. Operationally, NMSI partners with non-profit organizations in participating states. These partners, known as NMSI state agents (NSAs), oversee implementation of CRP and act as NMSI's agent supporting districts, schools, and teachers in the state. The program evaluation for this grant used a quasi-experimental design, employing a comparative interrupted time series analysis to examine the difference in student outcomes in participating schools versus a set of comparison schools of similar demographics and size.

[1] Vilorio, D. (2014, Spring). STEM 101: Intro to tomorrow's jobs. *Occupational Outlook Quarterly*, 1–11. Washington, D.C.: Bureau of Labor Statistics. Retrieved from http://www.bls.gov/careeroutlook/2014/spring/art01.pdf

[2] National Math and Science Initiative received an i3 validation grant supported by the U.S. Department of Education's Investing in Innovation program through Grant Number U411B110004. Validation grants provide funding to support the expansion of projects that address persistent education challenges to the regional or national level. All i3 grantees are required to conduct rigorous evaluations of their projects. The quality of evidence required to demonstrate a project's effectiveness depends on a project's level of scale or grant type.

THE COLLEGE READINESS PROGRAM MODEL

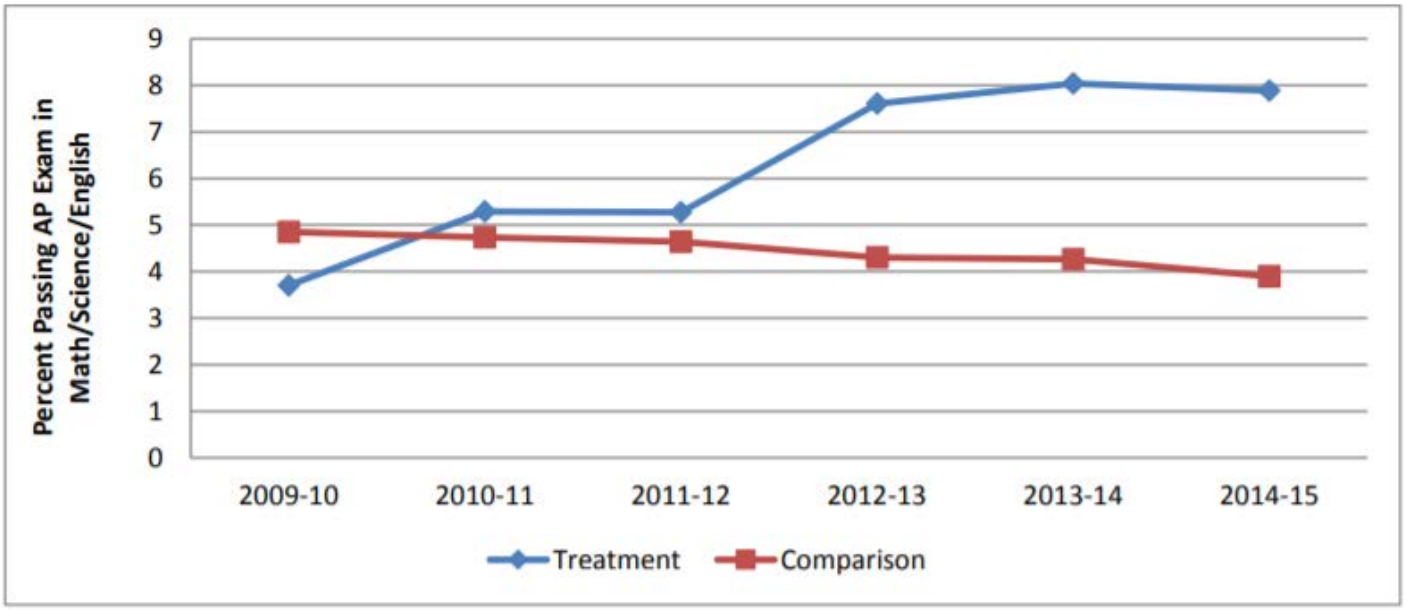
- **Program Management.** To make changes to school culture and put processes in place to implement CRP in schools, NMSI trained content specialists who worked with schools on-site for one week in the summer before implementation. As part of their training, content specialists learned how to manage and monitor each element of the program, including supporting and mentoring AP teachers. Content specialists received further training during a two-day retreat each year, where they also discussed lessons learned and collaborated on solutions to issues encountered. Each implementing school also designated an administrator who assisted with implementation and served as a school liaison for the NSA. Each NSA provided an annual performance report and sent data to NMSI three times per year regarding AP course offerings, AP course enrollment and demographics, and AP exam results.
- **Teacher Supports.** Teachers had access to training, content specialists, and cross-grade level teams (known as vertical teams). These supports were intended to increase their content knowledge and improve instruction. All AP teachers also received content-based training sessions and workshops on AP standards and attended the appropriate College Board Summer Institute each year. The institutes provided them with a four-day training led by certified College Board trainers, along with online curricular resources. Lead teachers provided overall supervision of AP programs, managed vertical teams, and, in tandem with content specialists with extensive AP course experience, monitored AP teachers in program schools. NMSI also provided teachers with three six-hour Saturday study sessions each year where they could learn content and pedagogy.
- **Student Supports.** The program provided students with tutoring and Saturday study sessions. Participating advanced placement (AP) teachers were expected to provide students with a minimum of 40 hours of afterschool tutoring each year. Subject-matter experts led Saturday study sessions in math, science, and English. The program offered at least four of these sessions to students per year. Students could take practice AP exams at the sessions and also had access to online resources related to their homework.
- **Awards.** CRP provided financial incentives to participating teachers and students. At the end of each school year, teachers received $100 for each student who passed an AP exam, as well as a $1,000 bonus if a set number of students received passing scores. Students were given $100 for each AP test they passed within the targeted subjects of math, science, and English. CRP also covered 50% of exam fees.

Summary of Results

DID CRP IMPROVE STUDENTS' AP OUTCOMES?

The key findings are based on a three-year impact analysis of the first cohort of CRP high schools in Colorado and Indiana. The evaluators considered this to be the key analysis because it captured the impact of the program after the full three-year period of implementation. The difference in gains made by CRP schools versus non-CRP schools by year 3 is statistically significant. Additionally, at year 3, CRP schools had relatively greater proportions of students *taking* and *passing* AP exams in targeted subjects than comparison schools. These differences were statistically significant across Math, Science, and English.

School-Level Change in Percent of Students Passing Math/Science/English



- **AP EXAMS TAKEN.** By the end of the third year, the percentage of grade 10-12 students in CRP schools who took an AP exam in the target subjects of math, science, or English increased by 8.6 percentage points compared to the average percentage in the three years before implementation started. Over the same time period, comparison schools saw a 2.1 percentage point drop in AP tests taken in these subjects relative to the average over the three years prior to the start of the intervention. This difference is statistically significant..

- **AP EXAMS PASSED.** By the end of year 3, the percentage of grade 10-12 students in CRP schools who passed an AP exam in math, science, or English (earning a score of at least 3 out of 5) increased by 3.1 percentage points compared to the average percentage that had passed in the three years before program implementation. In contrast, in the same timeframe, non-CRP schools had a 0.9 percentage point drop in AP tests passed in these subjects. This difference is statistically significant.

Please see Appendices B and C for information about the evaluation's design and the quality of the evidence, respectively.

OTHER CONSIDERATIONS

The study reported fidelity of implementation results for the key components of CRP. The evaluators also administered surveys to teachers and students to determine how useful they found different aspects of the program.

- **IMPLEMENTATION FIDELITY.** Using a fidelity of implementation matrix, CRP set performance targets for each program component and required that 80% of schools meet the targets in order to achieve implementation fidelity. Across cohorts and years, the program management and awards components were implemented with fidelity while the teacher and student supports components were not. Schools faced particular challenges implementing teacher attendance at the required number of vertical team meetings, as well as teacher and student attendance at Saturday study sessions.
- **USEFULNESS: STUDENT SUPPORTS.** Approximately 90% of students in both Colorado and Indiana found the tutoring supports somewhat or extremely useful. Similar proportions of respondents felt the same about the group study sessions, with 85% of students in Colorado finding them somewhat or extremely useful and 89% viewing them the same way in Indiana.
- **USEFULNESS: TEACHER SUPPORTS.** Over 90% of teachers in each state found the professional development supports somewhat or extremely useful. In addition, 85% of teachers in Indiana found the collaboration supports somewhat or extremely useful, while 93% reported the same in Colorado. Regarding content specialist supports, 80% of teachers in Colorado found them somewhat or extremely useful, while 85% did so in Indiana.
- **USEFULNESS: FINANCIAL AWARDS.** Although 71% of students in Colorado and 69% in Indiana found the financial awards somewhat or extremely useful, only 45% and 51% of teachers in Colorado and Indiana, respectively, felt the same way.

For More Information

Evaluation Reports
Final Evaluation Report (AIR, August 2017)[3]

[3] The information and data for this result summary was collected from the most recent report as of 01/22/2020: AIR (2017). *Final Report of the Impacts of the National Math + Science Initiative's (NMSI's) College Readiness Program on High School Students' Outcomes*. Retrieved from https://files.eric.ed.gov/fulltext/ED577450.pdf

Appendix A: Students Served by the Project[4]

GRADE(S)

PK	K	1	2	3	4	5	6	7	8	9	10	11	12

GENDER	RACE/ETHNICITY	COMMUNITY
Not Reported	Not Reported	Not Reported

HIGH-NEED STUDENTS[i]

Free/Reduced-Price Lunch	English Learners	Students with Disabilities
52.5%	N/A	N/A

[4]These data reflect the entire student population served by the intervention, not just the evaluation sample used in the impact study.

Appendix B: Impact Evaluation Methodology[5]

RESEARCH DESIGN

Design:	Quasi-Experimental Design
Approach:	▪ The study used a comparative interrupted time series to compare student outcomes in participating versus non-participating schools. Program schools were statistically matched to a set of comparison schools in the same state with similar demographics and enrollment and comparable AP performance prior to program implementation.
Study Length:	Three years

DATA COLLECTION AND ANALYSIS

Study Setting:	High Schools in Colorado and Indiana
Final Sample Sizes:	▪ *Intervention Group:* 58 high schools participating in CRP ▪ *Comparison Group:* 58 high schools not participating in CRP
Intervention Group Characteristics:	▪ Free/reduced-priced lunch: 61% ▪ Free/reduced-priced lunch: 52.5% ▪ White: 53.4% ▪ Grade 10-12 enrollment: 1,365 ▪ Average Taking AP Exam in Math, Science, or English (over three baseline years prior to implementation): 12.5% ▪ Average Passing AP Exam in Math, Science, or English (over three baseline years prior to implementation): 4.5%
Comparison Group Characteristics:	▪ Free/reduced-priced lunch: 50.0% ▪ White: 52.9% ▪ Grade 10-12 enrollment: 1,319 ▪ Average Taking AP Exam in Math, Science, or English (over three baseline years prior to implementation): 11.1% ▪ Average Passing AP Exam in Math, Science, or English (over three baseline years prior to implementation): 4.2%
Data Sources:	▪ Student Records: AP tests taken and passed during the school year or the summer after the school year ▪ Surveys: coordinators, teachers, students (for implementation fidelity)
Key Measures:	▪ AP outcome 1: The percentage of students in grades 10-12 in a school year who had taken an AP test in a targeted subject area (math, science, or English) ▪ AP outcome 2: The percentage of students in grades 10-12 in a school year who had taken and passed an AP test in a targeted subject area

[5] These data reflect only the evaluation sample in the impact study, not the entire population served.

Appendix C: Quality of the Evidence

WHAT WORKS CLEARINGHOUSE REVIEW[6]

STUDY	RATING
Not reviewed as of 01/22/2020	N/A

EVIDENCE FOR ESSA REVIEW[7]

STUDY	RATING
Not reviewed as of 01/22/2020	N/A

NATIONAL CENTER ON INTENSIVE INTERVENTIONS REVIEW[8]

STUDY	RATING
Not reviewed as of 01/22/2020	N/A

[6] https://ies.ed.gov/ncee/wwc/FWW
[7] https://www.evidenceforessa.org/
[8] https://intensiveintervention.org/

*The **Investing in Innovation Fund (i3)**, established under section 14007 of the American Recovery and Reinvestment Act of 2009, is a Federal discretionary grant program at the U.S. Department of Education within the Office of Elementary and Secondary Education (OESE). i3 grants help schools and local education agencies work in partnership with the private sector and the philanthropic community to develop and expand innovative practices that improve student achievement or student growth, close achievement gaps, decrease dropout rates, increase high school graduation rates, and/or increase college enrollment and completion rates for high-need students.*

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[i] "High-need student" refers to a student at risk of academic failure or otherwise in need of special assistance and support, such as students who are living in poverty, attend high-minority schools, are far below grade level, who have left school before receiving a regular high school diploma, at risk of not graduating with a diploma on time, who are homeless, in foster care, have been incarcerated, have disabilities, or who are English learners. For more information see: Applications for New Awards; Investing in Innovation Fund-Development Grants, 81 FR 24070 (April 25, 2016).