

The JROTC Impact Study: Bringing Cybersecurity Skills and Training to JROTC Cadets



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https://www.csforall.org/projects_and_programs/jrotc/



Bringing Cybersecurity to JROTC Cadets

Cybersecurity talent is critically needed across the U.S. to ensure the protection of information of our defense, healthcare systems, financial ecosystem, and more.

To address the need for more cybersecurity professionals, CSforALL has launched a privately funded demonstration project (JROTC-CS) to include cybersecurity as a part of courses JROTC cadets take in high school [1]. The potential exists to engage over 500,000 high school JROTC cadets in computer science and cybersecurity education pathways and build technology education capacity at over 3,400 JROTC high schools.

Further, cadet populations are 55% underrepresented and 40% female [5]. Over 50% of the cadets are located at Title 1 Schools, indicating low socio-economic status. Creating pathways for JROTC cadets has the potential to increase the number of underrepresented students who gain computer science and cybersecurity skills.

JROTC-CS Demonstration Project

The JROTC-CS Demonstration Project is a pilot of a multi-year intervention designed to bring CS and cybersecurity education to 30 high schools in the United States that offer the Air Force Junior Reserves Officer Training Corps (AF JROTC).

The JROTC-CS Project is a unique blend of workshops, webinars, and activities that high schools with JROTC programs can engage in to build CS and Cybersecurity education into their offerings (e.g., courses and extracurricular activities like CyberPatriot) [4] and do so in an equitable manner.

Teams from each of the participating high schools attended a kick-off workshop in February 2020 [2]. School teams consisted of JROTC instructors, principals, counselors, and CS teachers from the schools in the cohort across the country who were selected to be part of the JROTC-CS Demonstration Project.

Each of the teams created a comprehensive 3-month, 6-month, and one-year plan for implementation. They then engaged in implementing the plans during the 2019-20. This included attending webinars and various other touch points with the JROTC-CS implementation team throughout the year.

Investigating the Impact of JROTC-CS

The overarching research questions in support of this project are:

- In what ways does the JROTC-CS experience impact the knowledge, skills, and interest in/awareness of JROTC careers among JROTC cadets?
- In what ways does the JROTC-CS experience impact the school curriculum program in CS and Cybersecurity (e.g., offering more CS/cybersecurity courses, additional professional development experiences for teachers, additional students at the schools engaged in CS and cybersecurity)?

We were also interested in whether the impact was equitable across schools and among different student population subgroups.

We sought to understand the complexities of the project and how various factors, inputs, and outcomes correlate, particular with a focus on reaching marginalized communities and subgroups of students. This includes changes in course offerings and enrollment in courses by students.

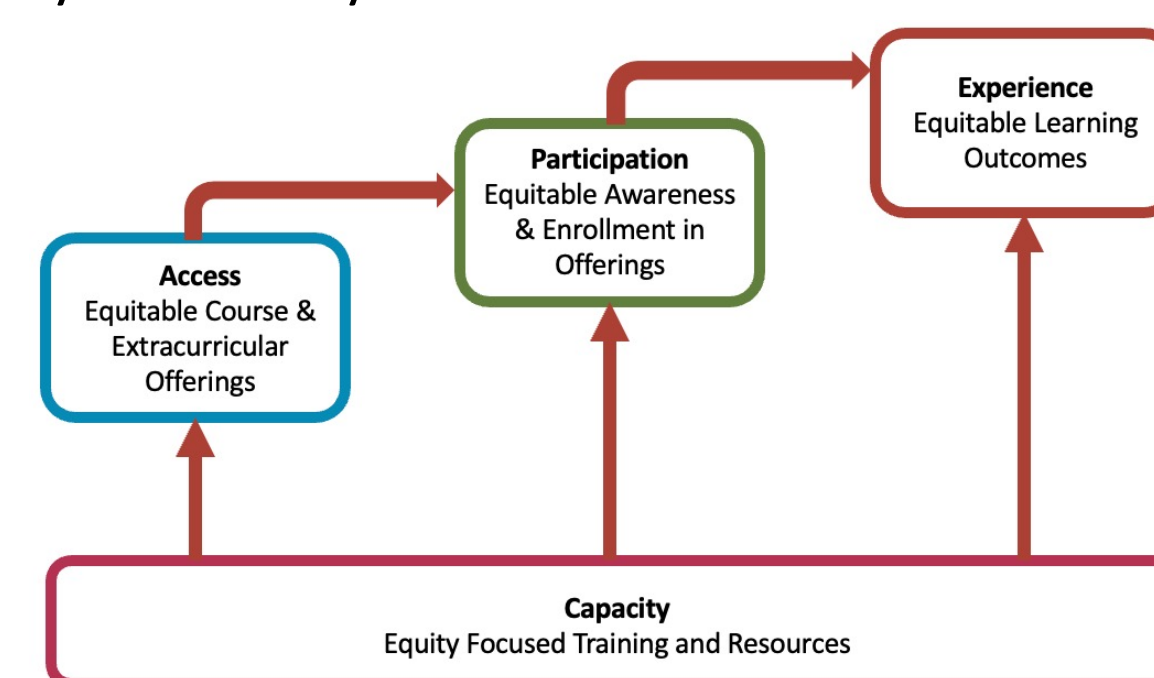
This evaluation is important for two reasons: 1) CAPE is a new, equity-focused framework, and testing the framework across various interventions can provide validation of its usefulness and 2) for the JROTC-CS intervention, it provides another avenue of understanding its impacts and whether they correlate to the changes schools enacted.

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Methodological Framework

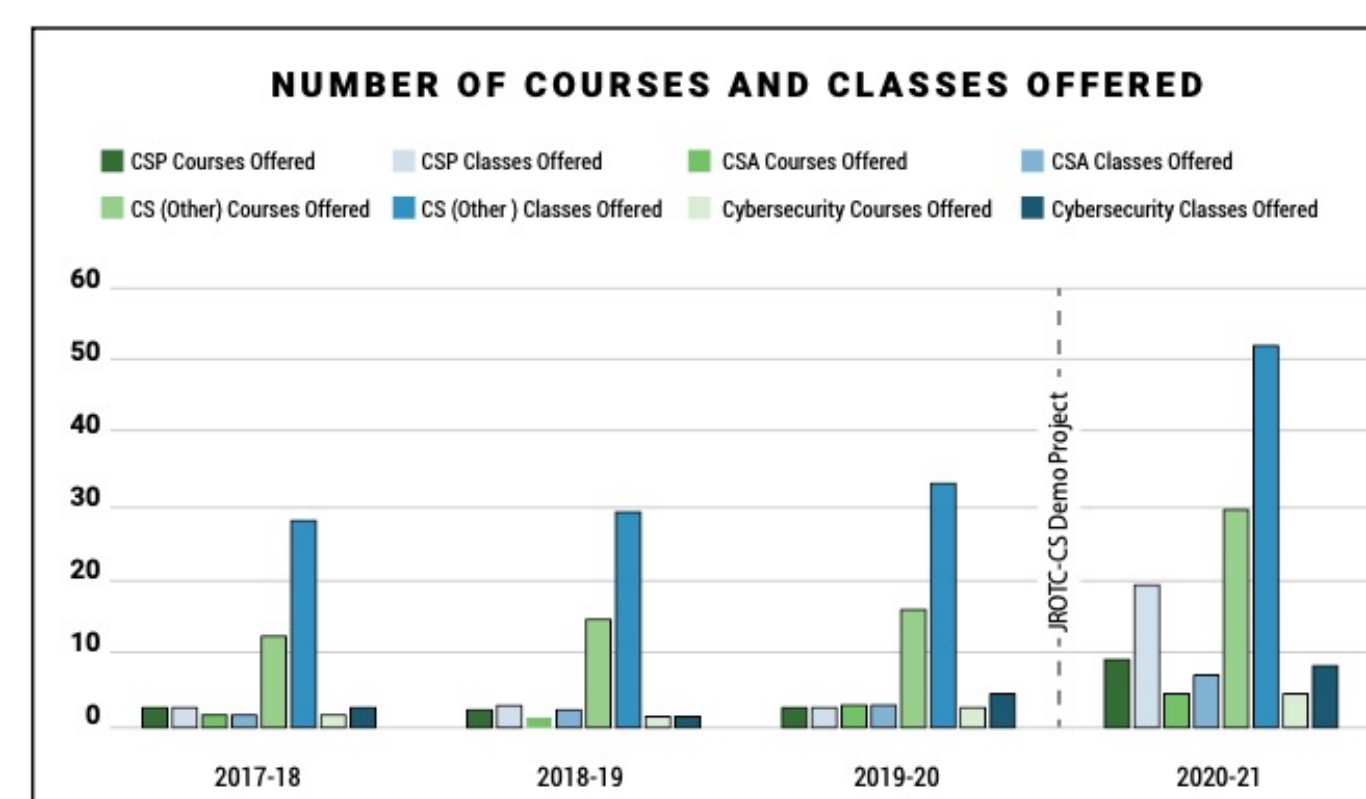
According to the CAPE Framework [3], schools that offer capacity to create equitable access to courses can lead to a diverse set of students enrolling. For schools engaged in an equity-focused, multi-school intervention for bringing the Advanced Placement (AP) CS Principles (CSP) course to schools, we hypothesized that the schools are more likely to: 1) offer AP CSP courses, 2) offer related CS courses, and 3) offer Cybersecurity courses and extracurricular activities. We also hypothesized that more students underrepresented and underserved in the field of computing and cybersecurity will enroll.



Pilot Access Results

The evidence indicates that CS and cybersecurity courses and classes increased across many schools. This includes a nearly three-fold increase in the number of AP CSP courses offered and a nearly seven-fold increase in the number of classes offered. Cybersecurity extracurricular activities also increased by 100%.

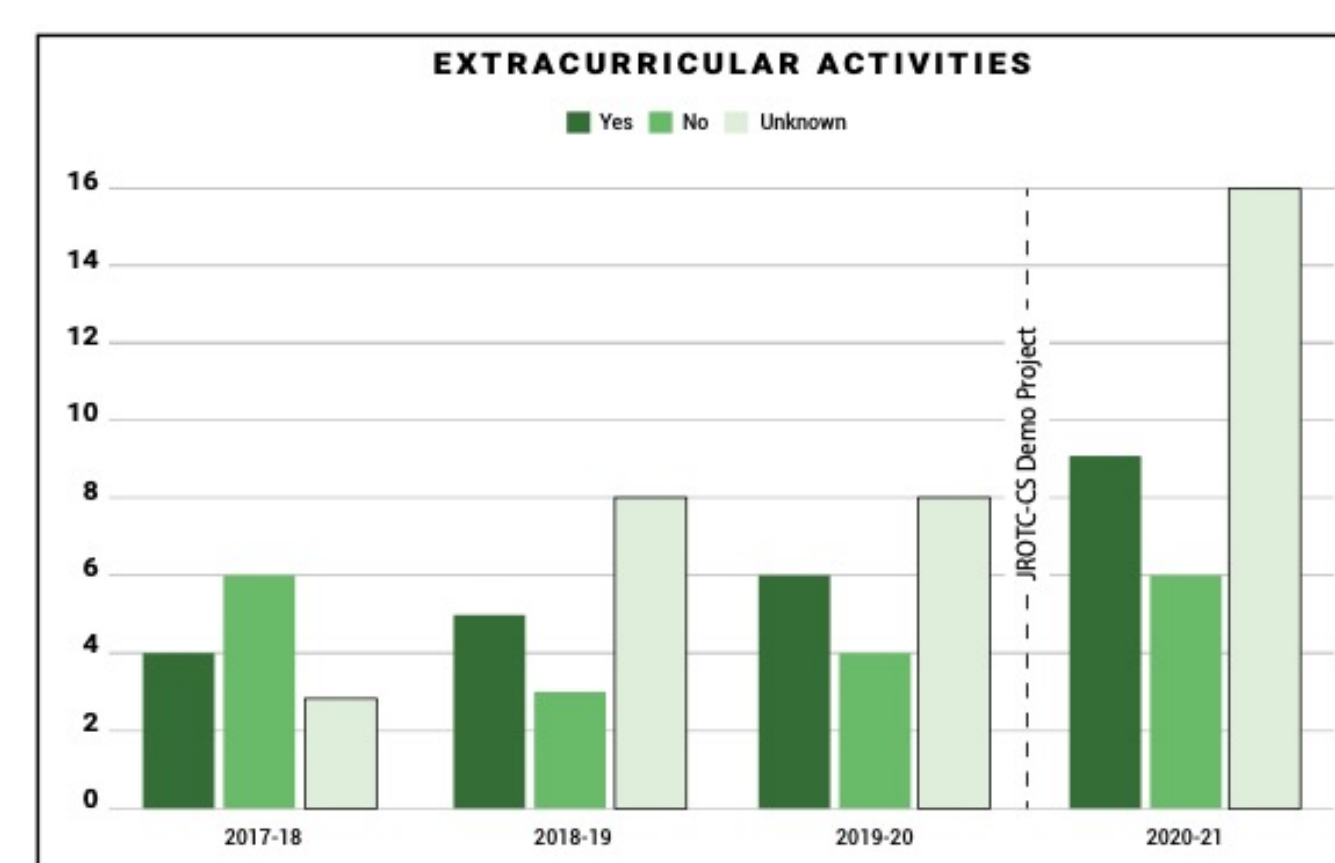
Impact on Course and Class Offerings Across Years



Impact on Different Course and Class Offerings

	Change in Courses Offered	Change in Classes Offered
AP CSP	3 to 11 (267%)	3 to 23 (667%)
AP CS A	4 to 6 (50%)	4 to 9 (125%)
Other CS Courses	19 to 35 (84%)	39 to 61 (56%)
Cybersecurity	3 to 6 (100%)	6 to 10 (67%)
CS Related Extracurricular Activities	4 to 6 (50%)	n/a
Cybersecurity Extracurricular Activities	8 to 16 (100%)	n/a

Impact on Extracurricular Offerings



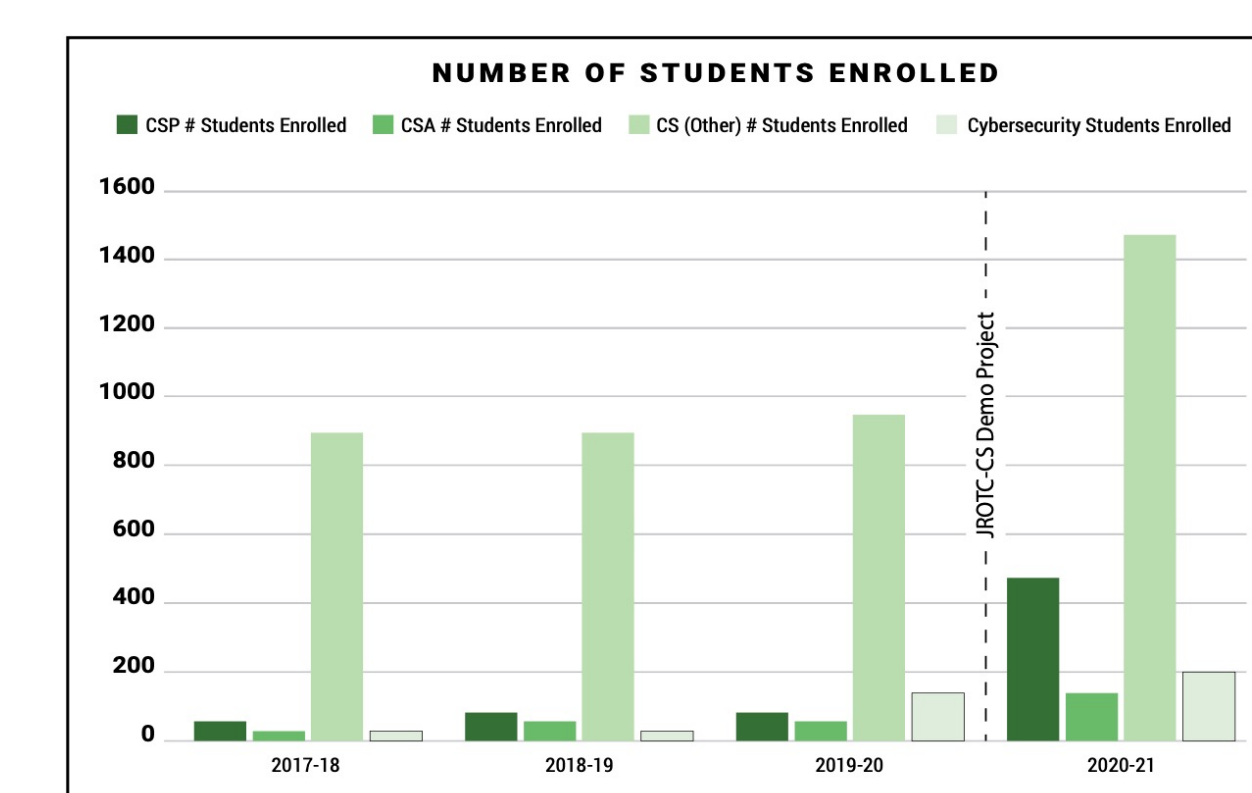
Impact on Title I vs Non-Title I Schools

	Course Count		Class Count	
	Title I	Not Title I	Title I	Not Title I
2017-18	10	12	15	26
2018-19	12	12	19	25
2019-20	15	14	21	31
2020-21	43	15	73	30
2019-20 to 2020-21 Percentage Change	187%	7%	248%	-3%

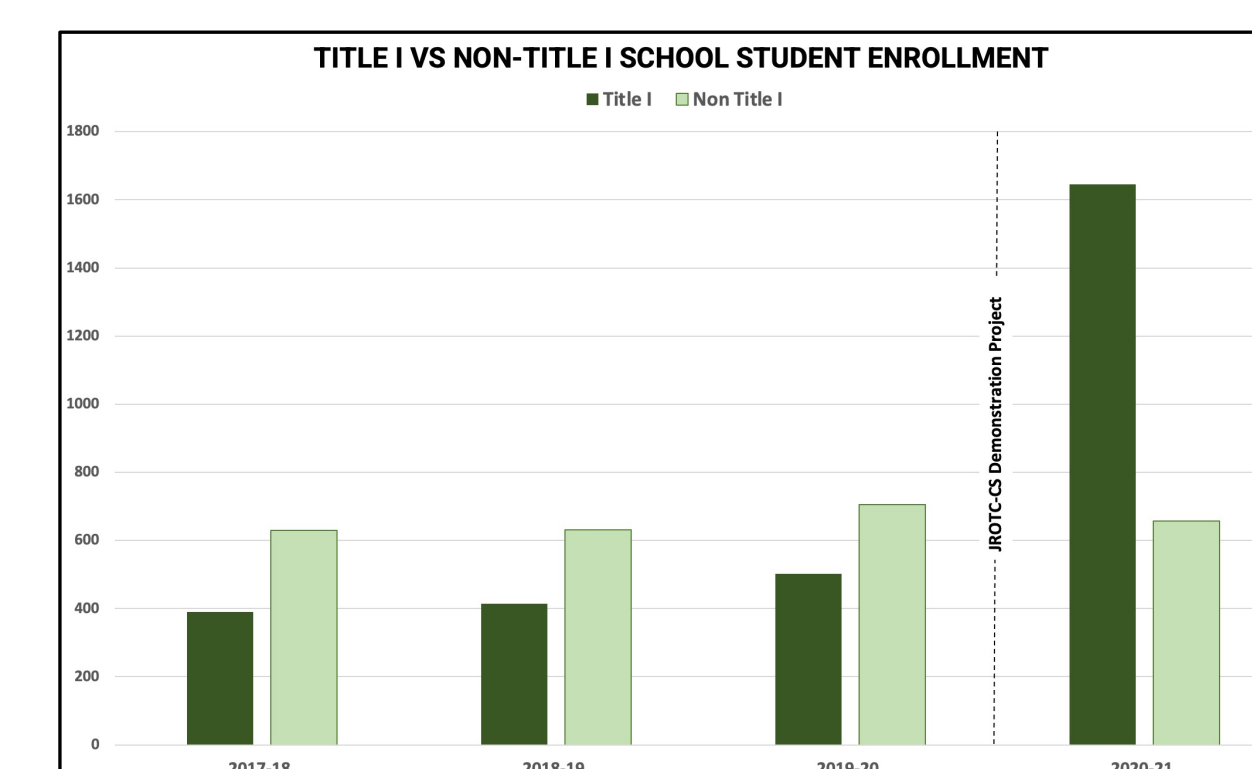
Pilot Participation Results

The enrollment dataset captures both cadets and other students at the high school.

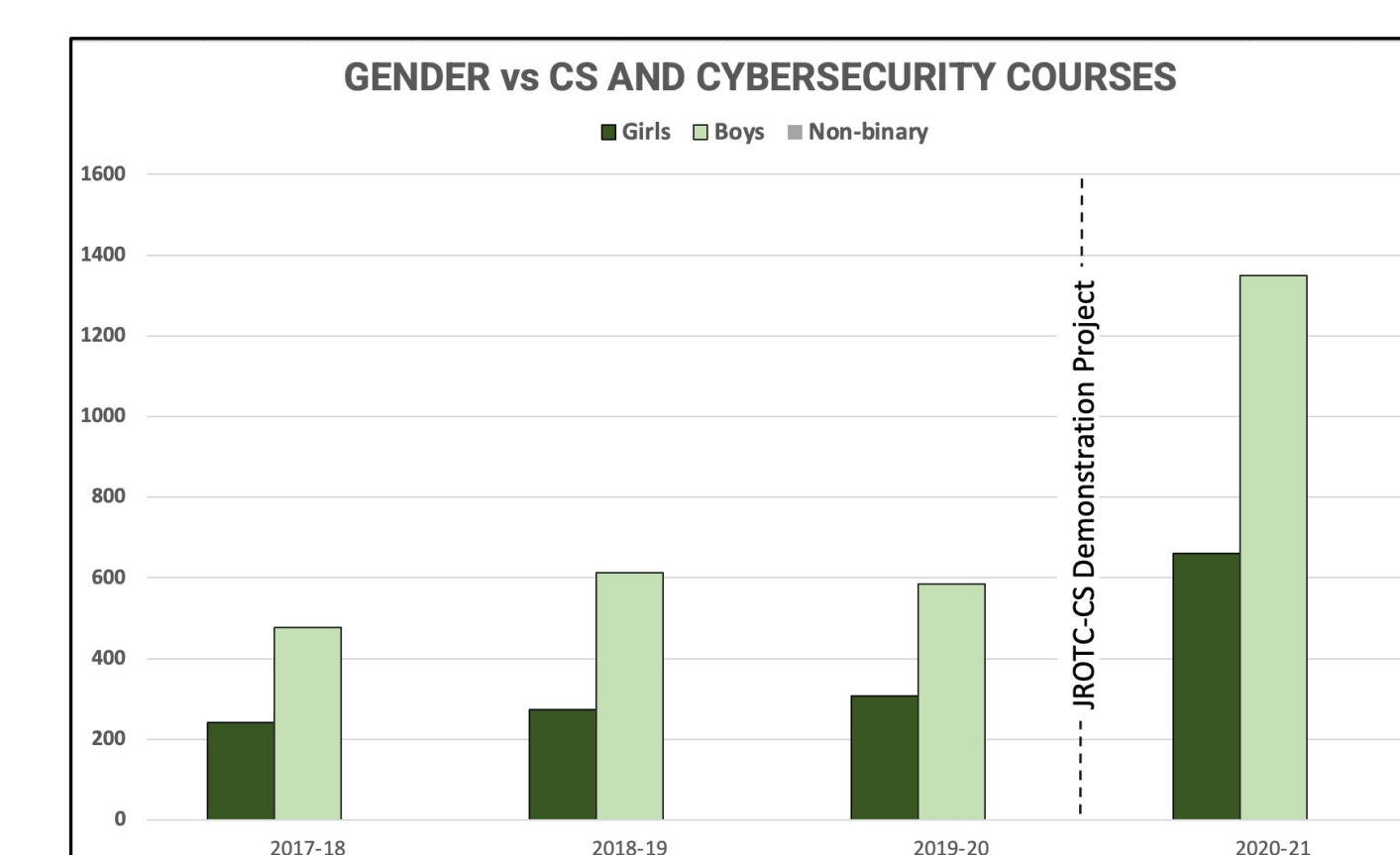
Impact on Enrollment Across Years



Impact on Title I vs Non-Title I Schools



Impact on Participation by Gender



Impact on Participation by Race/Ethnicity

	Increase in Students Enrolled
American Indian	3 to 35, 1,076%
Asian	42 to 251, 50%
Native Hawaiian/Pacific Islander	6 to 7, 17%
Hispanic	220 to 483, 120%
Black, Non-Hispanic	191 to 254, 33%
White, Non-Hispanic	412 to 644, 56%
Two or more races	18 to 48, 167%

Conclusion

Our research into the impact of the JROTC-CS Demonstration Project shows that this innovative intervention to bring CS and Cybersecurity education to high schools across the U.S. has been successful in increasing student enrollment in CS and Cybersecurity education.

Participating schools increased their capacity to build and maintain CS and Cybersecurity education, increasing the number of courses and classes offered, especially among Title I and majority-BIPOC schools. Additionally, enrollment among girls and BIPOC+ students increased more than enrollment among boys and White, non-Hispanic students.

There was also a significant increase in schools offering and students enrolling in AP CSP courses. This again was more significant at Title I schools and schools with more than 50% historically marginalized populations.

This project continues to grow and will include eight schools with Marine JROTC programs in Fall 2022. We will continue our investigation into the impacts throughout Fall of 2023.

References

- CSforALL. JROTC-CS, 2020. Retrieved June 10, 2020 from https://www.csforall.org/projects_and_programs/jrotc/.
- CSforALL. SCRIPT program, 2020. Retrieved June 10, 2020 from https://www.csforall.org/projects_and_programs/script/.
- Carol L Fletcher and Jayce R Warner. CAPE: a framework for assessing equity throughout the computer science education ecosystem. Communications of the ACM, 64(2):23-25, 2021.
- United States Air Force. Air Force Association's CyberPatriot: The national youth cyber education program, 2020. Retrieved February 10, 2020 from <https://www.uscyberpatriot.org/>.
- U.S. Air Force JROTC. Air force JROTC strategic plan 2017-2021, 2017.

