



NSF Grant #1339424

PI: Allison Scott, Ph.D.

Co-PI: Alexis Martin, Ph.D.

Co-PI: Danielle Rose, M.Sc.

TITLE: Broadening Participation: The Development, Implementation, and Evaluation of an AP Computer Science Preparatory Sequence for Underrepresented High School Students within the SMASH Academy

BACKGROUND: \$528,161 awarded in September 2013; Grant period runs from November 2013- November 2016.

SUMMARY: Given the lack of access to computer science courses among underrepresented high school students, this project aims to increase computer science knowledge, interest, aspirations, and increase the number of high school students of color in California taking and passing the AP Computer Science exam. This project will also provide a scalable model for replication of computer science pathways to college among underrepresented high school students of color in out-of-school settings, to greatly expand the number of African American and Latino students within the computer science pipeline.

ACTIVITIES/INTERVENTIONS:

- **Curriculum:** Develop a 4-course AP CS preparatory sequence which can be implemented in a 5-week summer program setting. The curriculum is adopted from Exploring Computer Science, Computer Science Principles, and AP Computer Science A, and the courses include: CS1 (ECS-10th graders), CS2 (BJC-11th graders), CS3+AP CS Prep (12th graders).
- **SMASH CS Programming:** Implement the CS course sequence in the SMASH Academy across 4 California sites serving approximately 250 students. Students receive 37.5 hours of CS instruction each summer for 3 summers, in addition to guest speakers, field trips, and other activities to further expose students to the field of computer science.
- **Professional Development:** Develop and implement a 5-day CS professional development course for SMASH CS instructors, and provide one-on-one coaching throughout the 5-week program.
- **Research:** Conduct research on the short-term and long-term outcomes of the SMASH CS curriculum, courses, and professional development. Contribute to body of literature on increasing access to CS and outcomes among underrepresented groups.

OUTCOMES:

- To-date, a total of **298** students have taken at least one CS course in the course sequence, and **201** students have completed two years of the CS course sequence. **191** underrepresented high school students completed the 5-week SMASH Computer Science courses in 2015.
- **32** SMASH high school seniors took the AP CS A exam after completing the SMASH AP Prep course (**21** took the AP CS A exam in May 2015; **11** took the AP CS A exam in the pilot year of May 2014).

- As a result of taking the SMASH CS courses, students demonstrated **statistically significant increases** in computer science content knowledge, interest in CS, CS attitudes, access to role models, and CS college and career aspirations, as measured by surveys and assessments.
- **44%** of SMASH students **intended to major** in computer science at the conclusion of the program, and **46%** aspired to pursue a career in the field of computer science. These percentages have **more than doubled** since the beginning of the project period. **19%** (n=14) of SMASH alumni in their freshman year (students who had 1 year of CS in the pilot year) have declared CS majors.
- **28** SMASH alumni are currently pursuing Computer Science majors
- Research on the SMASH CS project has culminated in: 2 evaluation reports, presentations of results at the Computer Science Teachers Association (CSTA) conference, the California Department of Education (CDE) STEM Symposium, the American Educational Research Association annual meeting, and the preparation of manuscripts (in process).

SUPPLEMENTAL ACTIVITIES:

- NSF Supplement Awarded (\$105,000) in August 2015, entitled: “*Building Strategic Partnerships, Enhancing Opportunities, and Developing a Computer Science Pipeline for Underrepresented Student.*” This supplement aims to expand on the original grant activities in the following ways:
 - Increase resources to expand the academic year AP CS preparatory course and increase the number of students completing the AP CS exam.
 - Host a set of workshops in with key stakeholders in Oakland to: (a) develop collective understanding of the CS landscape in Oakland, (b) develop a strategic plan for coordinating a set of CS pipeline initiatives, and (c) expand access and opportunity across the CS pipeline for students in Oakland.

NEXT STEPS: Expand CS Preparation and Workforce Development

- Build upon the 3-year NSF Computer Science investment in SMASH by:
 - Expanding the CS preparatory sequence to the two new SMASH campuses (increasing from 3-5 campuses, and increasing the number of students served)
 - Enhancing the academic year AP CS P and AP CS prep courses. Currently approximately 21 seniors complete the course AND take the AP CS exam (only 1,121 underrepresented students statewide complete the course). We could greatly increase the number of seniors taking and passing the AP CS exam with additional resources to the academic year CS program
- Build out a SMASH alumni workforce development program for students who have gone through the SMASH program (3 years of CS) and gone on to higher education. Approximately 45% of SMASH scholars intend to major in CS, and we can develop a program to help formally prepare

them to enter into tech workplaces through content preparation, technical training for internships, mentorship, etc.