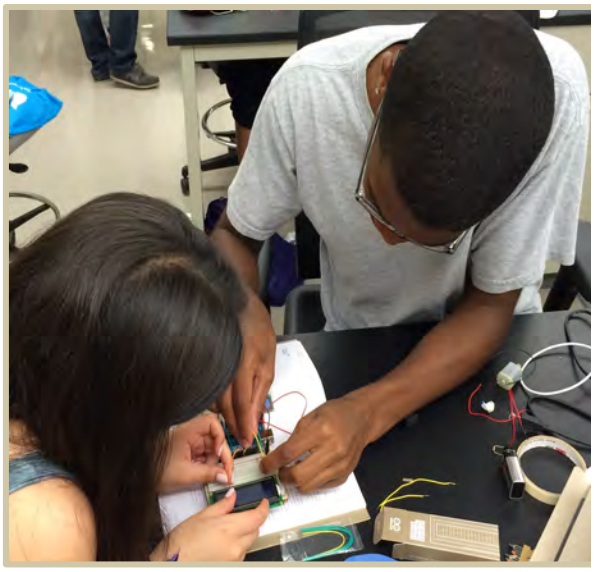
SMASH ACADEMY

LEVEL PLAYING FIELD INSTITUTE



2014 Evaluation Report

SUMMER MATH AND SCIENCE HONORS (SMASH) ACADEMY

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LEVEL PLAYING FIELD INSTITUTE

EXECUTIVE SUMMARY

To evaluate the impact of the SMASH program in 2014, data were collected from students across all four SMASH sites (UC Berkeley, Stanford, USC, and UCLA). Data collection procedures included: (1) Academic assessments examining growth in mathematics, science, and computer science skills and knowledge, (2) Pre- and Post-SMASH surveys examining students' attitudes and aspirations, (3) Open-ended questions assessing students' experiences and satisfaction with SMASH, (4) Alumni surveys tracking post-secondary data of SMASH alumni, and (5) Longitudinal academic year data to analyze coursetaking and grades. A total of 543 SMASH students were served in 2013-14, including 266 current students and 277 alumni. One hundred thirty students attended SMASH in Southern California at UCLA and USC, and 136 attended the Northern California sites at UC Berkeley and Stanford. The vast majority of all SMASH students were Latino (58%) and African American (30%); 49% were female, 84% were eligible for Free/Reduced Price Lunch (FRPL), and 70% were both Free/Reduced Priced Lunch and First Generation to graduate from college.

Major highlights from the 2014 evaluation include:

Math, Science and Computer Science Knowledge

- Ninety-four percent of SMASH students demonstrated an increase in computer science assessment scores over the course of the program.
- SMASH students demonstrated a statistically significant increase in their familiarity with computer science programming languages, from pre- to post-SMASH.
- In mathematics, 67% of SMASH students demonstrated an increase in math readiness from pre-post, with 76% of Pre-Calculus students improving in performance.
- Sixty-eight percent of SMASH students demonstrated gains in science assessment scores over the course of the program; 78% of students in Physics demonstrated gains in science scores from pre- to post-SMASH.

STEM Attitudes and Aspirations

- Over the course of the SMASH program, students demonstrated a large and significant increase in their attitudes towards computer science (Mean=3.79 to Mean=4.24). The percentage of students who indicated that they "liked" computer science increased 28 percentage points, from 59% to 87%.
- The percentage of students who believed it is important to have a strong math background increased by six percentage points. Over the course of the SMASH program, students demonstrated a significant increase in their attitudes towards science (Mean=4.36 to Mean=4.44). From pre to post-SMASH, the percentage of students who "care about doing well in science" increased by eight percentage points, from 88% to 96%.
- At the completion of SMASH, 87% of students indicated their plans to declare a STEM major, and 86% indicated the desire to pursue a career in STEM. By comparison, estimates suggest only 49% of all 9-12th graders intend to study STEM in college.[1]

[1] National Science Foundation, Science and Engineering Indicators, 2012, University of the Sciences, Survey Results:Students' Attitudes on Pursuing Sciences and Healthcare, 2012).

Preparation for Applying to College

- Students' familiarity with the college admissions process increased from 65% pre-SMASH to 78% post SMASH, and their reported preparation for performing well on college entrance exams increased by 10 percentage points.
- The percentage of students demonstrating knowledge about how to apply for financial aid increased by 12 percentage points, and the percentage of students demonstrating knowledge about student loans and how to apply for them increased by 10 percentage points.
- Students also became more confident in their ability to obtain financial aid to finance their college education (58% to 66%).

Access to STEM Role Models and Networks of Support

- Statistically significant increases were demonstrated in students' access to networks of STEM peers and role models.
- Post-SMASH, 83% of students indicated they had met individuals working within STEM fields who impacted their future college and career goals, an increase from 67% pre-SMASH.
- The percentage of students who indicated they know students from similar backgrounds as their own who are interested in computer science increased by 11 percentage points. The percentage of students who reported feeling part of a community of students who are interested in computer science increased by nine percentage points.

Leadership, Critical Thinking, and Social Justice Orientation

- Students demonstrated a significant increase in self-reported identification with social justice principles, leadership skills, and critical thinking skills from pre-SMASH to post-SMASH.
- The percentage of students reporting confidence in their ability to evaluate arguments and theories increased by eight percentage points.
- The percentage of students who indicated that they see the examples of computer science in their everyday lives increased from 69% to 86%, and there was a 17 percentage point increase in students who believed computer science can be an effective tool to solve community issues (63% to 80%).

Post-Secondary Outcomes

- Seventy-six percent of SMASH alumni have been tracked. Of these, 100% graduated from high school (compared to the national average high school graduation rate of 75%)[2] and 98% are either currently enrolled in a college or university, or have completed their degree (compared with 45% of all 18-24 year-olds).[3]
- Sixty-eight percent of SMASH alumni have declared STEM majors. By comparison, only 23% of all college freshmen declare STEM majors[4].
- Eight-four percent of alumni intended to major in STEM while in high school and 82% of those went on to declare a STEM major in Year 1; 83% of those who declared STEM majors in Year 1 persisted beyond Year 3 in STEM.

[2] National Science Foundation (NSF), Science and Engineering Indicators, 2010.
[3] U.S. Dept. of Commerce, Census Bureau, Percentage of 18-24 Year-Olds Enrolled in Colleges/Universities, 2009.
[4] U.S. Dept. of Education, Education Dashboard: Percent of Bachelor's Degrees Conferred in STEM Fields, 2009.

ABOUT LPFI

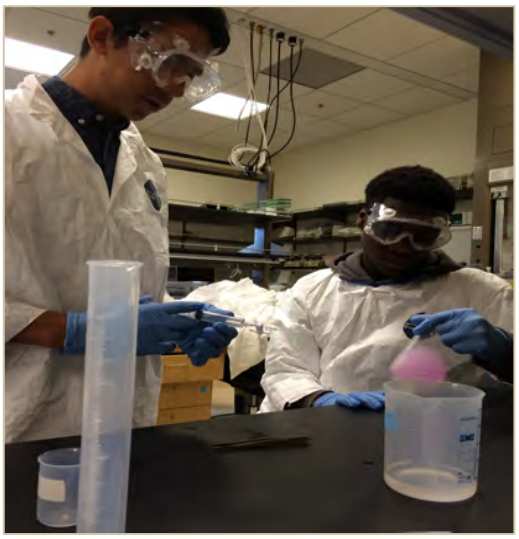
The Level Playing Field Institute (LPFI) is an Oakland-based non-profit that is committed to eliminating the barriers faced by underrepresented people of color in science, technology, engineering and math (STEM) and fostering their untapped talent for the advancement of our nation.

To improve access, opportunity, and equity in STEM, the Level Playing Field Institute:

- Operates **STEM-focused Education Programs** at the middle school and high school level (SMASH Academy and SMASH Prep)
- Conducts **Research on STEM Equity and Opportunity**
- Executes **Innovative Computer Science Initiatives**

ABOUT SMASH

The Summer Math and Science Honors (SMASH) Academy, the flagship program of the Level Playing Field Institute, is a three-year, five-week summer STEM enrichment program for low-income high school students from backgrounds underrepresented in STEM fields. The SMASH program currently operates across four sites in Northern and Southern California. The program began in 2004 at the University of California, Berkeley and has since expanded to Stanford University (2011), University of California, Los Angeles (2012) and University of Southern California (2012). The SMASH program offers rigorous STEM coursework, engaging curriculum which intentionally integrates culturally relevant pedagogy and technology, exposure to diverse STEM role models and networks of STEM peers, and preparation for the college applications process. In addition to academic enrichment, the program provides students with the opportunity to live on campus in dorms, where they are guided through activities focusing on social development, cultural competence, social justice orientation, and college success skills. This curriculum ensures that students of color are able to discuss and examine issues of race, class, gender, and inequity, while focusing on building confidence and support networks to alleviate barriers to STEM in higher education.



OBJECTIVES OF THE SMASH IMPACT EVALUATION

(1) Examine the goals, objectives, and activities of the SMASH program and construct measures to assess impact in each critical area.
(2) Collect data from SMASH students to measure academic growth, attitudes, aspirations, and skills, and understand students' perspectives of the SMASH program.
(3) Utilize the data and findings to document outcomes and inform program growth and improvement.

METHODOLOGY

Data Collection

The SMASH impact evaluation included five different forms of data collection: (1) Academic assessments examining growth in mathematics, science, and computer science knowledge, (2) Pre-Post-SMASH student survey examining students' attitudes and aspirations, (3) Open-ended qualitative questions to understand student experiences with the program, (4) Alumni survey tracking post-secondary data of SMASH alumni, and (5) Student demographic data and academic year data to analyze coursetaking and grades. Details about each form of data collection are included in Figure 1 (below).

Analytical Procedures

All quantitative data were analyzed using SPSS statistical package. The percentages for each item were recorded (e.g., % strongly agree/agree) for both pre- and post-SMASH responses; the percentage change between pre- and post- was then calculated to determine growth or stagnation. Each item was grouped with its corresponding scale/variable and reliability analyses were conducted; for reliable scales, individual items were summed into scales. The mean of each scale (pre- and post) was then calculated, and paired-samples T-tests were run to determine if the mean values changed significantly from pre- to post- condition.[5]

All qualitative data were analyzed using HyperResearch. Open-ended items were analyzed by compiling codes and sorting into numerical categories in order to produce frequency reports based on general themes.

Figure 1.

		Description	Data Collection Procedures
Academic Assessments	**Math**	The SMASH mathematics assessments were designed by the LPFI Curriculum Director in collaboration with SMASH Lead Instructors. They are comprised of released test questions from the SAT, CST, and AP mathematics exams, in order to measure student readiness for a range of mathematics courses and to provide instructors with information about student preparedness.	SMASH students were given mathematics assessments to determine readiness for their Fall 2014 math courses and to examine impact of the SMASH math courses. Tests included Algebra II, Pre-Calculus, and Calculus, and were administered to students prior to the start of the SMASH program and again at the end of the program. Data are reported for 235 of the 266 current SMASH students who completed both the pre- and post-math assessments.
	Science	The SMASH science assessments were designed by the LPFI Curriculum Director in collaboration with SMASH Lead Instructors. They are comprised of released test questions from the SAT, CST, and AP science exams, to measure student readiness for a range of science courses	The science assessments were given to each student on the first day of SMASH and again on the last day of SMASH. Tests included Biology, Chemistry, and Physics, and data are reported for 246 of the 266 current students who completed both the pre- and post- science assessments.

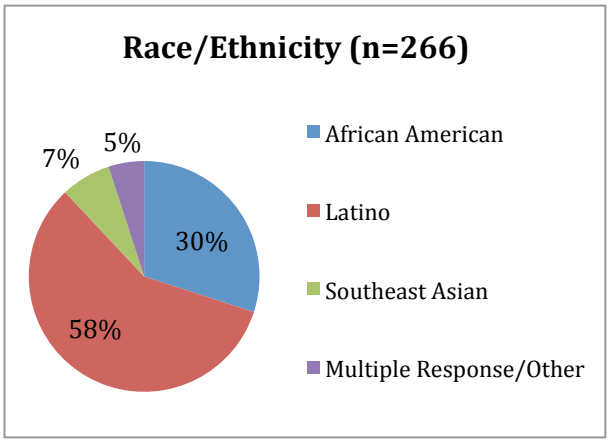
[5] Methodological note: All scales are comprised of items rated on a 5-point Likert scale, and the mean values on each scale range from 1-5 with 5 being the highest possible value. Mean values and significant pre-post changes are reported. All item percentages reported reflect the percent of students who strongly agreed and/or agreed with each item.

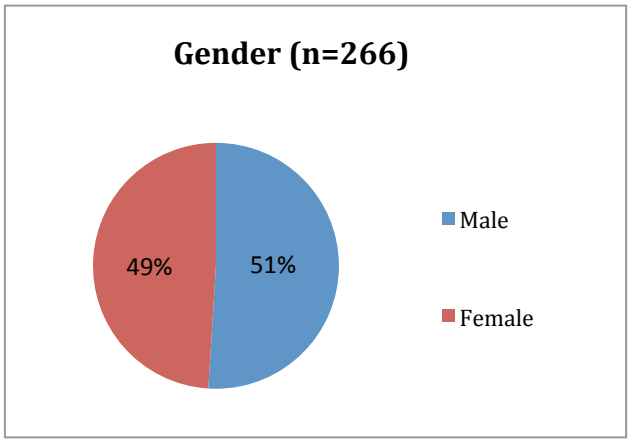
		and to provide instructors with information about student preparedness.	
	Computer Science	The SMASH computer science assessments were designed by the LPFI Curriculum Director in collaboration with SMASH Computer Science Instructors. While few standardized tests exist to measure computer science growth, the assessments were developed to measure student readiness for a range of computer science concepts and skills, and to provide instructors with information about student preparedness.	Computer science assessments were given to each student in their computer science class on the first day of SMASH and again on the last day of SMASH. Tests included Computer Science 1, Computer Science 2, and Computer Science 3, and data are reported for 255 of the 266 current students who completed both the pre- and post- science assessments.
Pre-Post SMASH Impact Student Survey		The SMASH impact survey was designed by LPFI's research department in consultation with research literature in education and psychology. 35 variables were identified as key metrics to examine SMASH impact, including attitudes towards math and science, STEM college and career aspirations, leadership skills, and access to STEM role models (see Appendix 1). Individual items were developed to measure each scale.	All students completed the pre-SMASH survey prior to the beginning of the program (on the weekend they moved into the dorms) and the post-SMASH survey on the last day of the program. Data is reported for 252 of the 266 current SMASH students who completed both the pre- and post- program survey.
Qualitative Data Collection		Open-ended items were included in the pre- post- survey to examine student experience within SMASH, aspects which had the greatest/least impact on them, and satisfaction with their courses.	Data were collected on open-ended items in the pre-post SMASH survey administered at the beginning and end of the SMASH program.
SMASH Alumni Survey		An alumni survey was designed by the LPFI research department to capture updated information on the post-secondary outcomes of SMASH alumni (including college of enrollment, major, etc.).	The alumni survey was sent out in July 2014 to the 277 alumni who had completed the SMASH program and graduated high school as of June 2014. Responses were received for more than three-quarters of alumni; thus, alumni data are available for 211 of the 277 alumni (76%).
Student Demographic and Academic Year Data		Demographic data includes gender, race/ethnicity, income, family educational background. Academic year data includes coursetaking, grades, and in some cases, test scores.	Demographic data were collected during the application process and academic year (including test scores, grades, coursetaking, etc.).

SMASH ACADEMY DEMOGRAPHIC DATA

	1st Years	**2nd Years**	**3rd Years**	**Total Current Students**	**Total Alumni**	**Total Students + Alumni**
University of CA, Berkeley	25	17	24	66	200	266
Stanford University	19	28	23	70	77	147
University of CA, Los Angeles	22	18	26	66	0	66
University of Southern CA	19	20	25	64	0	64
Total Students	**85**	**83**	**98**	**266**	**277**	**543**

Academic Data	
Average Current Math Grade	A-
Average GPA	3.6
Socioeconomic Indicators	
Free/Reduced Price Lunch Eligibility	84%
Average Household Income	$51,600
Average Household Headcount	5
First Generation College	78%
Both FRPL & First Generation	70%





SMASH EVALUATION RESULTS

Goal 1: Ensure students increase STEM knowledge, skills, and preparation for STEM studies in higher education.

Mathematics Readiness

- 67% of SMASH students demonstrated an increase in mathematics readiness from pre- to post-SMASH, with an average of four more items correct on the post exam. Twelve percent of students had no change from pre to post and 21% decreased in performance (Figure 2).

> ***"I was able to get ahead on a course I will be taking this academic year."***
>
> -1st year SMASH: UCLA student

Figure 2.

Overall Math Assessment Data			
	# of students	% of students	Avg. # items (+/-)
Increase (post>pre)	157	67%	+4 items
No Change (post=pre)	29	12%	0 items
Decrease (post<pre)	49	21%	-2 items
TOTAL SAMPLE (completed pre and post assessment)	235	--	+2 items

- In Pre-Calculus, 76% of students demonstrated an increase in readiness skills, and these students increased by an average of two items.

- 65% of Calculus students demonstrated an increase in readiness, with an average of three more correct items on the post exam.

- In Algebra II, 58% of students increased in readiness from pre to post program, with an average increase of four items (Figure 3).

Figure 3.

Mathematics Pre-Post Data, By Course				
		# of students	% of students	Avg. # items (+/-)
Algebra II (n=62)	Increase	36	58%	+7 items
	Same	9	5%	0 items
	Decrease	17	27%	-3 items
Pre-Calculus (n=78)	Increase	59	76%	2 items
	Same	8	10%	0 items
	Decrease	11	14%	4 items
Calculus (n=95)	Increase	62	65%	3 items
	Same	12	13%	0 items
	Decrease	21	22%	2 items

- Among students who demonstrated growth from pre-post, 34% increased by 3-5 items, and another 25% increased by six or more items (Figure 4).

- Among students who demonstrated no growth from pre-post, 59% decreased by 1-2 items (Figure 5).

Figure 4.

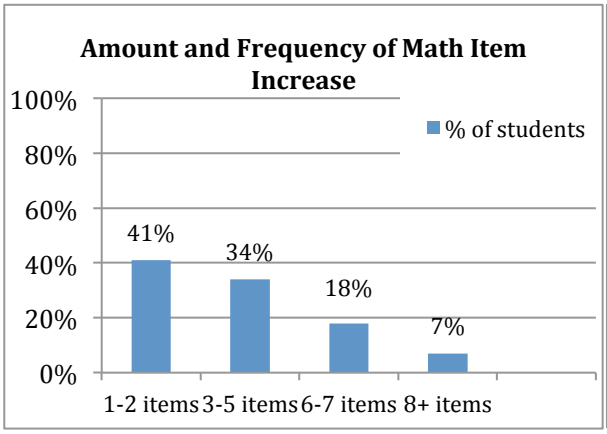
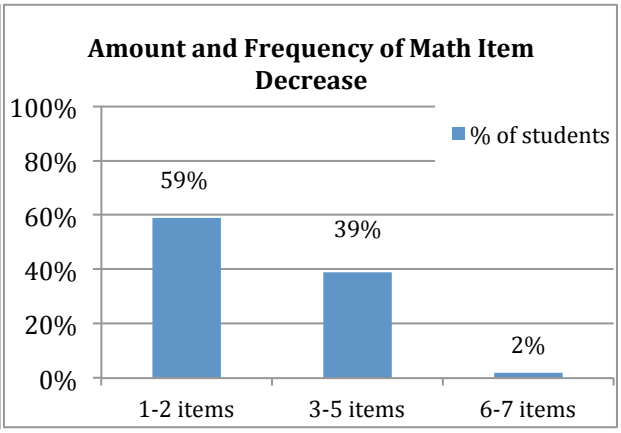


Figure 5.



Science Readiness

- 68% of SMASH students demonstrated an increase in science assessment scores over the course of the program, with an average increase of three items. Eight percent

"Our instructor made biology fun and interesting and at the same time taught us more than I could imagine."

-1st year SMASH: Berkeley student

demonstrated no change, and 14% decreased in performance from pre- to post-SMASH (Figure 6).

Figure 6.

Overall Science Assessment Data			
	# of students	% of students	Avg. # items (+/-)
Increase (post>pre)	167	68%	3
No Change (post=pre)	20	8%	0
Decrease (post<pre)	59	24	-2
TOTAL SAMPLE (completed pre and post assessment)	246		+2 items

- Students demonstrated strong gains in Physics, with three-quarters of students (76%) increasing from pre-post, by an average of four items.

- 65% of students increased in performance in Chemistry, and 62% demonstrated an increase from pre-post SMASH in Biology (Figure 7).

Figure 7.

Science Pre-Post Data, By Course				
		# of students	% of students	Avg. # items (+/-)
BIOLOGY (n=82)	Increase	51	62%	2
	Same	9	11%	0
	Decrease	22	27%	-2
CHEMISTRY (n=74)	Increase	48	65%	3
	Same	5	7%	0
	Decrease	21	28%	-2
PHYSICS (n=90)	Increase	68	76%	4
	Same	6	6%	0
	Decrease	16	18%	-2

- Among students who demonstrated growth from pre-to post-SMASH, 41% increased by 3-5 items, and another 17% increased by six or more items (Figure 8).

- Among students who decreased from pre- to post-SMASH, 73% decreased slightly, by 1-2 items (Figure 9).

Figure 8.

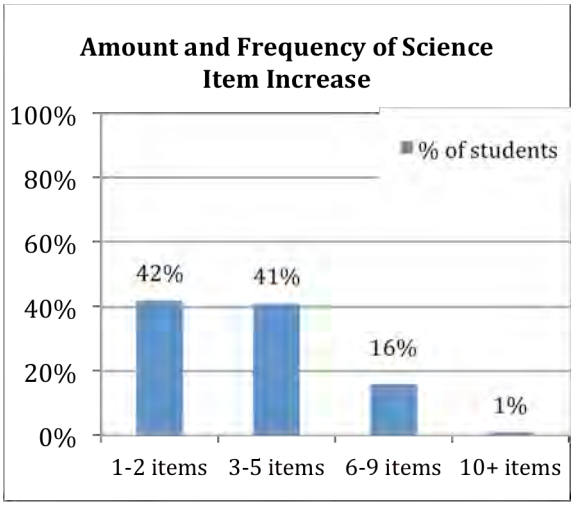
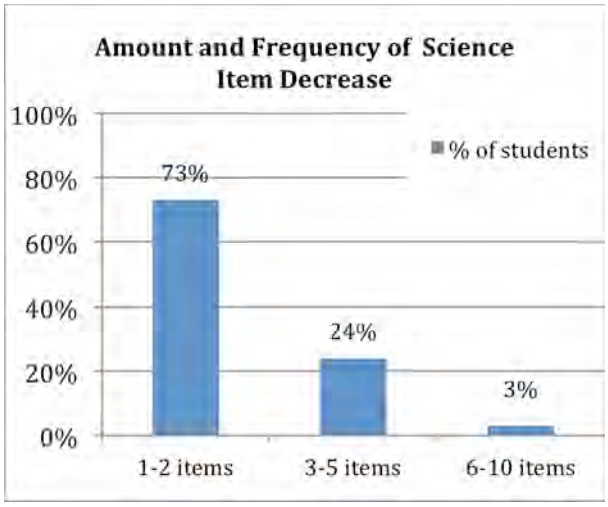


Figure 9.



Computer Science Skills and Knowledge

- 94% of SMASH students demonstrated an increase in computer science assessment scores over the course of the program, with an average increase of eight items. Two percent demonstrated no change, and 4% decreased in performance from pre- to post-SMASH (Figure 10).

Figure 10.

Overall Computer Science Assessment Data			
	# of students	% of students	Avg. # items (+/-)
Increase (post>pre)	241	94%	8
No Change (post=pre)	4	2%	0
Decrease (post<pre)	10	2%	-3
TOTAL SAMPLE	255		+7 items

- Students demonstrated strong gains in Computer Science I and Computer Science III, with 97% and 96% increasing from pre-post, respectively, by an average of eight and 10 items, respectively.

- 90% of students increased in performance in Computer Science II, with an average increase of five items (Figure 11).

Figure 11.

Computer Science Pre-Post Data, By Course				
		# of students	% of students	Avg. # items (+/-)
COMPUTER SCIENCE I (n=107)	Increase	104	97%	8
	Same	0	0%	0
	Decrease	3	3%	-2
COMPUTER SCIENCE II (n=79)	Increase	71	90%	5
	Same	4	5%	0
	Decrease	4	5%	-2
COMPUTER SCIENCE III (n=69)	Increase	66	96%	10
	Same	0	0%	0
	Decrease	3	4%	-4

- Among students who demonstrated growth from pre-post, 47% increased by eight or more items (Figure 12).

- Among the 10 students who decreased from pre- to post-SMASH, 60% decreased slightly, by 1-2 items (Figure 13).

Figure 12.

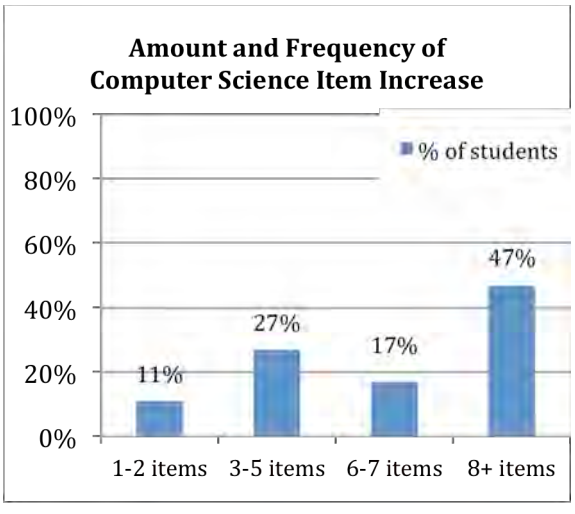
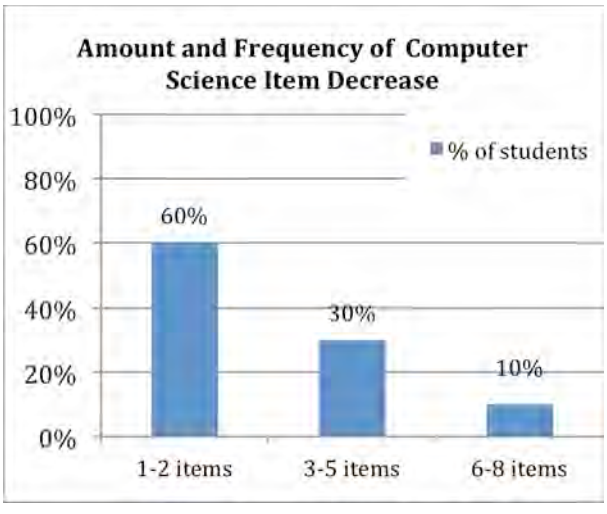


Figure 13.



- SMASH students demonstrated a statistically significant increase in their familiarity with computer science programming languages, from pre-SMASH (Mean=2.32) to post-SMASH (Mean=3.06), p<.00.[6]

    - By the end of SMASH, 86% of students rated their knowledge for using variables and blocks in Scratch as "very good" or "good," an increase of 36 percentage points.

    - The percentage of students reporting familiarity with programming using Java increased by 25 percentage points, with the percentage of students rating their familiarity as "very" or "somewhat" good increasing from 14% to 39%.

    - The percentage of students reporting familiarity with using CSS increased by 19 percentage points, and the percentage rating their knowledge of HTML increased by 18 percentage points.

- Students also gained clarity on what the field of computer science is, increasing by 23 percentage points in "understanding what computer science is" and demonstrating a statistically significant increase in their familiarity with the computer science field and computing careers, from pre-SMASH (Mean=3.74) to post-SMASH (Mean=4.23), p<.00.

Technology Skills and Knowledge

- Students demonstrated a statistically significant increase in technology skills and knowledge from pre-SMASH (Mean= 3.44) to post-SMASH (Mean=3.69), p<.00.

- Students demonstrated a 10 percentage point increase from pre- to post-SMASH in self-rating of technology skills.

Goal 2: Ensure students gain access to role models, develop support networks, and develop positive identities necessary to pursue and succeed in STEM in higher education.

Self-Efficacy

- Students demonstrated a statistically significant increase in computer science self-efficacy from pre-SMASH (Mean=3.82) to post-SMASH (Mean=4.07), p<.00.

- Students demonstrated small, yet non-statistically significant, increases in self-efficacy in mathematics (Mean diff= .03) and self-efficacy in science (Mean diff=.02).

- Students reported high levels of self-efficacy in math and science at both pre- and post-SMASH, and at the end of the program, 96% of students believed they are capable of doing well in math and science.

[6] Pre-post differences are considered "statistically significant" if the p-value is <0.05 (meaning the differences are unlikely to have occurred by chance).

Belongingness in STEM

- Although the percentage of SMASH students reporting feeling like their ideas count increased (87% to 89%), the overall belongingness scale decreased from pre- to post.

Access to Role Models in STEM

- SMASH students reported a significant increase in access to role models in STEM fields from pre-post (Mean=3.77 to 4.04, p<.00).

> ***"We actually got to see people in the STEM fields who look just like us, and wow, if they can do it, I can do it too!"***
>
> -2nd year SMASH: Berkeley student

- SMASH students also reported a significant increase in access to STEM role models from diverse racial and gender backgrounds (Mean=3.54 to 3.77, p<.00).

- The percentage of students who had personal familiarity with individuals with careers in STEM fields increased by 10 percentage points.

- Post-SMASH, 83% of students indicated they had met individuals working within STEM fields who impacted their future college and career goals, an increase from 67% pre-SMASH.

- There was a nine and 11 percentage point increase (respectively) in the percentage of students reporting exposure to role models of color in STEM and female STEM role models. There was also a nine and seven percentage point increase (respectively) in the percentage of students reporting exposure to role models of color in computer science and female computer science role models.

- The percentage of students who knew individuals with careers in computer science increased by 14 percentage points (from 50% to 64%) from pre to post-SMASH.

> ***"Being around other students of color interested in STEM over the past three years has really motivated me to follow my dreams."***
>
> -3rd year SMASH: Berkeley student

Access to Network of STEM Peers

- Participating in the SMASH program resulted in a significant increase in students' access to networks of STEM peers (Pre-SMASH Mean=4.25, Post-SMASH Mean=4.35).

- Specifically, the percentage of students indicating that they know students from similar backgrounds as their own who are interested in STEM increased by six percentage points; The percentage of students who reported feeling part of a group of peers who support their STEM goals increased by three percentage points.

- SMASH students also reported a significant increase in access to computer science support networks from pre-SMASH (Mean=3.27) to post (Mean=3.56), p<.00.

- The percentage of students who indicated they know students from similar backgrounds as their own who are interested in

computer science increased by 11 percentage points. The percentage of students who reported feeling part of a community of students who are interested in computer science increased by nine percentage points.

Goal 3: Prepare students to successfully complete the college admissions process, obtain financial aid, and be accepted to attend a four-year university.

College Aspirations

- Prior to SMASH, 95% of students aspired to attend a four-year university after graduation; this percentage increased slightly to 97% post-SMASH.

Understanding of College Application Process

- SMASH students' knowledge of and preparation for the college application process increased significantly from pre-SMASH (Mean=3.44) to post-SMASH (Mean=3.68), p. <.00.

> ***"I was very proud of everything I learned and was able to accomplish this year."***
>
> -2nd year SMASH: Stanford student

- The percentage of students demonstrating familiarity with college admissions & successfully completing a college application and preparation for performing well on college entrance exams increased by 13 percentage points and by 10 percentage points, respectively.

Familiarity with Financial Aid Application Processes

- SMASH student familiarity with financial aid processes and applications increased significantly over the course of the summer program. Students' familiarity increased from an average score of 3.34 to an average score of 3.60 from pre-post (Diff=.26), p.<00.

- The percentage of students demonstrating knowledge about how to apply for financial aid increased by 12 percentage points, and the percentage of students demonstrating knowledge about student loans and how to apply for them increased by 10 percentage points.

- Students also became more confident in their ability to obtain financial aid to finance their college education (58% to 66%).

Goal 4: Instill a sense of social responsibility, critical thinking, and leadership in all students.

Leadership Skills

- Students demonstrated a large, significant increase in their leadership skills from pre-SMASH (Mean=3.90) to post-SMASH (Mean=4.07).

- A nine percentage point increase was demonstrated in students' comfort in leading, planning, and decision-making within groups (74% to 83%), and their self-reported leadership skills (68% to 77%).

Critical Thinking

- A significant increase was seen from pre- to post-SMASH in students' self-reported critical thinking skills (Mean=3.60 to Mean=3.72), p<.00.

- The percentage of students reporting confidence in their ability to evaluate arguments and theories increased by eight percentage points (80% to 88%) and the percentage of students reporting ability in examining differing viewpoints increased by three percentage points (89% to 92%).

Ethnic and Gender Identity

- Students demonstrated a small, yet non-significant, increase in their connection to their ethnic identity from pre- to post-SMASH (Mean diff=.12).

- Students demonstrated a significant increase in their connection to their gender identity from pre- to post-SMASH (Mean=3.34 to Mean=3.60), p<.00.

Cultural Competency

- Seventy-six percent of students rated themselves highly in cultural competence at the start of the SMASH program, and this percentage increased to 85% by the end of the program.

> ***"I felt accepted and like I belonged."***
>
> -3rd year SMASH: Berkeley student

- Students showed a slight increase in their comfort level in interacting with diverse peers (81% to 82%).

Social Justice Orientation

- Students demonstrated a significant increase in identification with social justice principles from pre-SMASH (Mean=4.36) to post-SMASH (Mean=4.46), p<.02.

> ***"Seeing fellow minorities reach success in STEM motivated me."***
>
> -2nd year SMASH: Stanford student

- The percentage of students demonstrating the desire to use STEM knowledge to solve problems within their communities increased slightly, from 91% to 92%.

Endorsement of Racial and Gender Stereotypes

- The endorsement of negative racial stereotypes about ability in STEM fields decreased, but not significantly, from pre-SMASH to post-SMASH (1.48 to 1.43).

- The percentage of students who held the belief that "Asians and Whites have better math and science ability than African Americans and Latinos" decreased two percentage points.

Goal 5: Develop and increase students' STEM interests, attitudes, and aspirations.

Attitudes towards Math and Science

- SMASH students generally held highly positive attitudes towards math and science prior to the start of the program.

- The percentage of students who believed it is important to have a strong math background increased by six percentage points. Over the course of the SMASH program, students demonstrated a significant increase in their attitudes towards science (Mean=4.36 to Mean=4.44).

- From pre to post-SMASH, the percentage of students who "care about doing well in science" increased by eight percentage points, from 88% to 96%.

Attitudes towards Computer Science

- Over the course of the SMASH program, students demonstrated a large and significant increase in their attitudes towards computer science (Mean=3.79 to Mean=4.24).

- The percentage of students who indicated that they "liked" computer science increased 28 percentage points, from 59% to 87%, and the percentage of students who indicated that they thought computer science was "fun" versus boring increased 20 percentage points, from 57% to 77%. A 19 point increase was seen in the percentage of students who found computer science "interesting" (from 70% to 89%).

> ***"I encountered a subject [computer science] that was new, challenging, and had me walk away with so much new knowledge."***
>
> -2nd year SMASH: USC student

Cultural Relevance of Computer Science

- Students demonstrated a significant increase in their belief in the cultural relevance of computer science from pre-SMASH (Mean=3.82) to post-SMASH (Mean=4.15), p<.00.

- The percentage of students who indicated that they see the examples of computer science in their everyday lives increased from 69% to 86%, and there was a 17 percentage point increase in students who indicated the belief that computer science can be an effective tool to solve community issues (63% to 80%).

STEM College Aspirations

- The majority of SMASH students entered the program with the articulated desire to pursue STEM education in college (83%). This percentage increased to 87% at the completion of the program.

"Engineering Design was my favorite because this was my first actual hands-on experience with engineering. I enjoyed being able to build our own prototype and having it actually work. It reinforced my decision to go into engineering."

-3rd year SMASH: USC student

STEM Career Aspirations

- The vast majority of students entered SMASH with the desire to pursue careers within STEM fields, yet there was still growth in STEM career aspirations from pre- to post-SMASH (Mean=4.36 to Mean=4.44).

- At the completion of SMASH, 86% of students planned to pursue a career within the fields of science, technology, engineering, or mathematics (compared to 83% pre-SMASH).

Computer Science Aspirations

- Students' desire to pursue computer science in college and career increased significantly from pre-SMASH (Mean=3.38) to post-SMASH (Mean=3.62).

- While only 33% of students entered SMASH intending to pursue a career in computer science, this percentage increased to 45% after the program.

- The percentage of students who indicated the desire to continue learning computer science skills increased nine percentage points over the course of the SMASH program.

Goal 6: Students will enroll, persist, and graduate with degrees in STEM in higher education at rates higher than the national average.

Total SMASH Alumni Demographics

- As of June 2014, SMASH had a total of 277 alumni (students who both completed the SMASH program and graduated from high school).

- 200 students have completed the SMASH: Berkeley program and another 77 students completed the SMASH: Stanford program (Figure 14).

Figure 14.

SMASH Site	# Summers in Operation	# of Alumni*
University of CA, Berkeley	11	200
Stanford	4	77
University of CA, Los Angeles	3	n/a
University of Southern California	3	n/a

*SMASH Alumni are defined as students who have completed the SMASH program and have graduated high school as of June 2014.

SMASH Alumni Racial, Gender, and Socioeconomic Demographics

- The majority of SMASH alumni are Latino (49%) and African American (26%), with 25% comprising all other groups.

- SMASH alumni are relatively equal in terms of gender, with slightly more males (51%) than females (49%).

- Over half of the SMASH alumni are eligible for Free/Reduced Price Lunch (FRPL, 54%), will be first-generation college graduates (57%), and 38% are both FRPL and first generation.

Figure 15.

Total n=277*	
Race/Ethnicity	
African American /Black	26%
Chicano/Latino	49%
Mixed Race/Multiple Response	8%
Southeast Asian	6%
Other (Native American, Pac Islander)	11%
Gender	
Male	51%
Female	49%
Socioeconomic Status	
Free/Reduced Price Lunch (FRPL)	54%
First Generation College	57%
Both FRPL & First Gen**	38%

**The number of FRPL and First Gen students was lower from 2004-2009 and has increased significantly 2009-current.

Higher Education Enrollment Data

- 100% of SMASH students graduated from high school, with 76% taking an AP STEM course during high school (Figure 16).

- 68% of SMASH alumni are currently declared STEM majors, with the most common major reported by SMASH alumni being biological sciences.

- In terms of persistence in STEM, 84% intended to major in STEM while in high school and 82% of those went on to declare a STEM major in Year 1; 83% of those who declared STEM majors in Year 1 persisted beyond Year 3 in STEM.

- The most frequent colleges of attendance among alumni are U.C. Berkeley, U.C. Santa Cruz, and Stanford (Figure 16).

Figure 16.

SMASH ALUMNI (HS Graduation Class 2008-2014)		% of Alumni
High School Completion Data	Graduated from HS with Diploma	100%
	Did not graduate from HS	0%
High School A.P. Coursework	Took A.P. course during HS	83%
	Took A.P. STEM course during HS	76%
College Enrollment Status	Enrolled in undergraduate studies	75%
	Enrolled in graduate studies	8%
	Not enrolled in any college (completed Bachelor's degree)	15%
	Not enrolled in any college (did not complete degree)	2%
Type of College/University Currently Attending (Enrolled Undergrads Only)	Four-year college/university	92%
	Two-year college	8%
College Graduation Data	Number of SMASH alumni who have completed a Bachelor's degree	45
	% of college graduates currently attending graduate school	31%
Current Declared Major (All Students)	STEM Major	68%
	Non-STEM Major	28%
	Undecided	4%
Current Declared Major	STEM Major	74%

(Freshmen Only)	Non-STEM Major	19%
	Undecided	7%
Persistence in STEM	Intended to Major in STEM while in HS	84%
	Intended to Major in STEM in HS and did in Year 1 of college	82%
	Declared STEM major as freshman and persisted beyond Year 1 in STEM (current sophomores or above)	87% (87/100)
	Declared STEM as freshman and persisted beyond Year 2 in STEM major (current juniors or above)	81% (54/67)
	Declared STEM as freshman and persisted beyond Year 3 in STEM major (current seniors or above)	83% (38/46)

Figure 17.

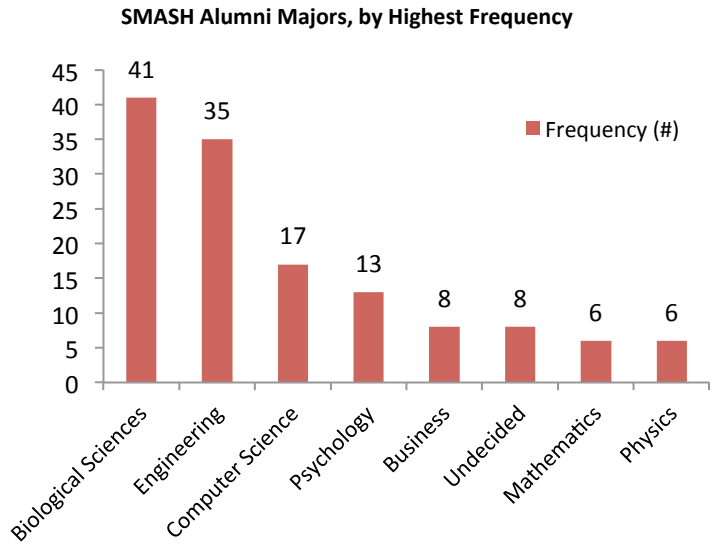


Figure 18.

Name of College/University	# of Alumni Currently Enrolled
Univ. of California, Berkeley	21
Univ. of California, Santa Cruz	11
Stanford University	9
San Jose State University	8
Univ. of California, Davis	8
Santa Clara University	7
Univ. of California, San Diego	5
Mass. Institute of Technology	4
Univ. of California, Riverside	4
University of Southern California	4
Cal State University, East Bay	3
Emory University	3
Ohlone College	3
Saint Mary's College of California	3
San Francisco State University	3
University of Pennsylvania	3
Univ. of California, Los Angeles	3
Univ. of California, Merced	3
Univ. of California, Santa Barbara	3

Alumni Perceptions of SMASH Impact

- 81% of SMASH alumni indicated that their participation in SMASH increased their math skills; 79% indicated that participating in SMASH increased their science skills, and 82% indicated that their SMASH participation increased their technology skills.

- 80% believed that participating in SMASH increased their confidence in their ability to do well in math and science classes in college.

- 72% indicated that SMASH increased their interest in studying STEM in college, and 78% believed SMASH helped them feel confident when going through the college application process.

- The majority of students indicated that SMASH gave them a more positive view about the STEM abilities of underrepresented racial groups (87%) and women (84%).

Appendix 1. Scale Mean Differences (Pre-Post), Paired-Samples T-Test Results by Scale

Scale	Mean (Pre)	Mean (Post)	Mean Diff (Pre-Post)	Sig. (2-tailed)
Explicit Attitudes Towards Science	4.36	4.44	0.08	.04**
Explicit Identification with Science	4.54	4.54	0	.88
Explicit Attitudes Towards Math	4.14	4.12	-0.02	.59
Explicit Identification with Math	4.67	4.67	0	.77
Understanding of Computer Science Field and Computing Careers	3.74	4.23	0.49	.00**
Familiarity with CS Programming Languages	2.32	3.06	0.74	.00**
Attitudes towards Computer Science	3.79	4.24	0.45	.00**
Cultural Relevance of Computer Science	3.82	4.15	0.33	.00**
Perceptions of Computer Science	3.72	3.67	-0.05	.31
Ethnic Stigma Consciousness	2.82	3.04	0.22	.00**
Ethnic Identity	4.05	4.17	0.12	.14
Gender Stigma Consciousness	3.19	3.56	0.37	.00**
Gender Identity	3.34	3.6	0.26	.00**
STEM College Aspirations	4.35	4.43	0.08	.19
STEM Career Aspirations	4.36	4.44	0.08	.19
Computer Science Aspirations	3.38	3.62	0.24	.00**
Racial Stereotypes in Computer Science	4.49	4.62	0.13	.38
Gender Stereotypes in Computer Science	1.63	2.43	0.8	.00**
Access to Role Models in STEM	3.77	4.04	0.27	.00**
Access to Diverse STEM Role Models	3.54	3.77	0.23	.00**
Network of STEM Peers	4.25	4.35	0.1	.02**
Computer Science Support Networks	3.27	3.56	0.29	.00**
Scholar Identity	4.85	4.83	-0.02	.49
Belongingness in STEM	4.21	3.55	-0.66	.00**
Self-Efficacy in Math	4.13	4.16	0.03	.25
Self-Efficacy in Science	4.15	4.17	0.02	.55
Computer Science Self-Efficacy	3.82	4.07	0.25	.00**
Explicit Racial Stereotypes about Math and Science	1.48	1.43	-0.05	.22
Explicit Gender Stereotypes about Math and Science	1.4	1.41	0.01	.79
Familiarity with Financial Aid	3.34	3.6	0.26	.00**
Understanding of College Entry Requirements and Application Process	3.81	3.96	0.15	.00**
Basic Technology Skills	3.44	3.69	0.25	.00**
Leadership Skills	3.9	4.07	0.17	.00**
Critical Thinking Skills	3.6	3.72	0.12	.00**
Social Justice Orientation	4.36	4.46	0.1	.02**

Note: ** p<.05, indicative of significant increases from pre- to post-SMASH; All scale items were measured using a 5-point Likert scale , with the mean range for scales ranging between 1-5.

Appendix 2. Pre- and Post-SMASH Item Frequencies

ITEMS	SCALE (Reliabilities= α)	PRE-SMASH (%Strongly/ Somewhat Agree)	POST-SMASH (%Strongly/ Somewhat Agree)	PRE-POST DIFFERENCE
LikeDislikeSci	Explicit Attitudes Towards Science (α=.79)	93%	92%	-1%
SciFunBoring		88%	89%	1%
HowImportantSci	Explicit Identification with Science (α=.79)	93%	94%	1%
CareDoingWellSci		88%	96%	8%

HowImportantStrongSci		89%	92%	3%
SuccessSciImportantPartMe		83%	81%	-2%
MathFunBoring	Explicit Attitudes Towards Math (α=.88)	72%	73%	1%
LikeDislikeMath		84%	82%	-2%
HowImportantMath	Explicit Identification with Math (α=.74)	97%	97%	0%
CareDoingWellMath		99%	96%	-3%
HowImportantStrongMath		89%	95%	6%
SuccessMathImportantPartMe		90%	89%	-1%
UnderstandWhatCSIs	Understanding of CS Field & Computing Careers (α=.77)	69%	92%	23%
KnowCareersCS		67%	88%	21%
KnowledgeUsingVariablesBlocksScratch	Familiarity with CS Programming Languages (α=.86)	50%	86%	36%
KnowledgeUsingHTML		27%	45%	18%
KnowledgeProgrammingJava		14%	39%	25%
KnowledgeUsingCSS		18%	37%	19%
LikeDislikeCS	Attitudes towards Computer Science (α=.85)	59%	87%	28%
CSFunBoring		57%	77%	20%
CSInteresting		70%	89%	19%
SeeExamplesCSEverydayLIfe	Cultural Relevance of Computer Science (α=.72)	69%	86%	17%
CSUsedSolveProblemMyCommunity		63%	80%	17%
AnyoneExpertCS	Perceptions of Computer Science (α=.62)	92%	94%	2%
CompScientistsSpendLotTimeWorkingAlone		26%	23%	-3%
CSInRealWorldInvolvesCreativity		71%	77%	6%
EthnicityInfluencesTeacherInteract	Ethnic Stigma Consciousness (α=.81)	28%	31%	3%
MostPeopleJudgeMeEthnicity		41%	47%	6%
PeopleInterpretBehaviorBasedEthnicity		49%	55%	6%
MyEthinicityAffectsInteractOtherEthnicities		22%	29%	7%
MyEthnicityAffectsFeelAboutSelf		34%	43%	9%
FeelStrongAttachmentEthnicity	Ethnic Identity (α=.91)	76%	79%	3%
ConnectedToEthnicHeritage		73%	74%	1%
ValueEthnicBackground		85%	87%	2%
EthnicityMajorPartIdentity		77%	80%	3%
GenderAffectsPeopleActTowardMe	Gender Stigma Consciousness (α=.94)	52%	60%	8%
GenderAffectsHowPeopleTreatMe		53%	63%	10%
PeopleJudgeMeBasedOnGender		36%	49%	13%
GenderInfluencesHowFeelSelf	Gender Identity (α=.87)	41%	54%	13%
GenderCentralDefiningMe		47%	61%	14%
GenderContributesSelfConfidence		50%	63%	13%
IdentityTiedGender		48%	55%	7%
PlanToMajorSTEMinCollege	STEM College Aspirations (α=.96)	83%	87%	4%
PlanToCompleteBachelorsSTEM		80%	82%	2%
InFutureImagineMyselfWorkingSTEM	STEM Career Aspirations (α=.93)	87%	87%	0%
PlanToPursueSTEMCareer		83%	86%	3%
WantContinueLearningCSSkills	Computer Science Aspirations (α=.80)	78%	87%	9%
LikelyToMajorCS		26%	33%	7%
PlanPursueCSCareer		33%	45%	12%
KnowALotAboutSTEMCareers		68%	80%	12%
AALatinosLessCapableSuccessCS	Racial Stereotypes in Computer Science (α=.73)	87%	90%	3%
AsiansWhitesMoreCapableSolvingComputingProblems		87%	91%	4%
AllRacesEquallyCapableSolvingComputingProblems		8%	5%	-3%
AllRacesSameLevelAbilityCS		7%	6%	-1%
MyRacialGroupExcelsCS		30%	36%	6%
WomenLessCapableSuccessCS	Gender Stereotypes in Computer Science (α=.77)	5%	5%	0%
MenMoreCapableSolvingCSProblems		4%	3%	-1%
MenMoreLikelyExcelComputingCareers		9%	11%	2%
MenWomenEquallyCapableSolvingComputingProblems		90%	93%	3%
WomenMenSameLevelAbilityCS		85%	87%	2%
MetPeopleSTEMCareersImpactedMyCareerChoice	Access to Role Models in STEM (α=.61)	67%	83%	16%
KnowProfessionalsSTEMCareers		69%	79%	10%
RoleModelsSTEMPeopleOfColro	Access to Diverse STEM	62%	71%	9%

RoleModelsSTEMFemale	Role Models (α=.82)	57%	68%	11%
KnowStudentLikeMeInterestedSTEM	Network of STEM Peers (α=.83)	84%	90%	6%
FeelPartCommunityStudentsInterestedSTEM		87%	89%	2%
HaveGroupPeersSupportMySTEMGoals		86%	89%	3%
KnowPeopleCareersCS	Computer Science Support Networks (α=.83)	50%	64%	14%
HaveRoleModelsCSPeopleOfColor		43%	52%	9%
HaveCSRoleModelsFemale		34%	41%	7%
KnowLotStudentsLikeMeInterestedCS		52%	63%	11%
FeelPartCommunityStudentsInterstedCS		60%	69%	9%
BeingSuccessfulStudentImportantPartMe	Scholar Identity (α=.82)	98%	97%	-1%
DoingWellSchoolImportantToMe		99%	97%	-2%
MathSciFeelLikeBelong	Belongingness in STEM (α=.77)	87%	89%	2%
MathSciFeelIdeasCount		76%	75%	-1%
MathSciFeelAwkward		29%	13%	-16%
HowComfortableInteractingPeersDiffBackgrounds		81%	82%	1%
RateCulturalCompetenceAs		76%	85%	9%
ThinkMathSkillsAre	Self-Efficacy in Math (α=.80)	76%	78%	2%
IfTakeMathTestNowHowExpectDo		63%	63%	0%
HowWellExpectDoMathNextYear		87%	86%	-1%
CapableDoingWellMath		96%	97%	1%
ThinkSciSkillsAre	Self-Efficacy in Science (α=.85)	77%	65%	-12%
IfTakeSciTestHowExpectDo		66%	67%	1%
HowWellExpectDoSciNextYear		86%	88%	2%
CapableDoingWellSci		96%	95%	-1%
ConfidentCanSolveProblemsUsingCompApplications	Computer science self-efficacy (α=.71)	57%	64%	7%
CapableLearningComputingConcepts		84%	91%	7%
CapableDoingWellCS		83%	89%	6%
CSTooHardforMe		46%	61%	15%
AALatinosLessCapableSTEMSuccess	Explicit Racial Stereotypes about Math and Science (α=.74)	3%	3%	0%
AsiansWhitesBetterMathSciAbility		5%	3%	-2%
AsiansWhitesSmarter		1%	3%	2%
AnyStudentSuccessfulMathSciRegardlessRace		12%	7%	-5%
WomenLessCapableSTEMSuccess	Explicit Gender Stereotypes about Math and Science (α=.82)	1%	4%	3%
MenBetterMathSciAbilities		3%	2%	-1%
MenSmarterWomen		2%	1%	-1%
AnyStudentSuccessfulRegardlessGender		4%	6%	2%
AfterGraduateHSPlanAttendFourYearUniv		95%	97%	2%
HowImportantEarnDegree		98%	99%	1%
KnowHowApplyFinAid	Familiarity with Financial Aid (α=.87)	43%	55%	12%
KnowHowApplyLoanScholarship		57%	67%	10%
ConfidentAbilityObtainFinAid		58%	66%	8%
HowFamiliarAGReqs	Understanding of College Entry Requirements and the Application Process (α=.84)	91%	94%	3%
HowFamiliarWhatCourseSTEMMajor		74%	78%	4%
HowFamiliarWithCollegeEntryExams		88%	90%	2%
HowFamiliarHowAdmissionsCommittesSelectApps		65%	78%	13%
HowPreparedPerformWellCollegeEntranceExams		54%	64%	10%
HowConfidentAbilityWriteSuccessfulPersStatmt		62%	66%	4%
HowPreparedSuccessfullyCompleteCollegeApp		63%	68%	5%
RateWordSpreadsheetPWPTSkillsAs	Basic Technology Skills (α=.80)	52%	57%	5%
RateOverallTechSkillsAs		50%	60%	10%
FeelComfortableLeadingPlanningDecMakingPeers	Leadership Skills (α=.90)	74%	83%	9%
PersuasiveAssertiveWithPeers		70%	76%	6%
LeadershipSkillsAre		68%	77%	9%
ConfidentAbilityEvaluateTheoriesArguments	Critical Thinking Skills (α=.75)	80%	88%	8%
AbleExamineDiffViewpoints		89%	92%	3%
ConfidentAbilityChallengeAssumptions		99%	99%	0%
ChallengingInjusticeImportant	Social Justice Orientation (α=.61)	88%	88%	0%
PlanUseSTEMKnowledgeAddressCommunity		91%	92%	1%