

Creating a Learning Community among Diverse Financially Needy STEM Students

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Abstract

Although many California Community College students from underrepresented groups enter college with high levels of interest in science, technology, engineering, and mathematics (STEM), the majority of them drop out or change majors even before taking transfer-level courses due to a variety of reasons including financial difficulties, inadequate academic preparation, lack of family support, poor study skills, and inadequate or ineffective academic advising and mentoring. In 2009, Cañada College, a federally designated Hispanic-serving institution in the San Francisco Bay Area, received a National Science Foundation Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM) grant to develop a scholarship program for financially needy community college students intending to transfer to a four-year institution to pursue a bachelor's degree in a STEM field. In collaboration with the College's Mathematics, Engineering, and Science Achievement (MESA) program – an academic, personal, and professional support structure has been designed and implemented to maximize the likelihood of success of these students. This support structure aims to create a learning community among the scholars through a combination of academic counseling and mentoring, personal enrichment and professional development opportunities, and strong academic support services. This paper describes how faculty, staff, administrators, alumni, student organizations, and partners in industry, four-year institutions, and professional organizations can be involved in creating an academic infrastructure that promotes academic excellence, leadership skills, and personal and professional growth among the diversity of financially needy STEM students in a community college.

1. Introduction

Cañada College is a member of the California Community College System, and is one of three colleges in the San Mateo County Community College District. It is one of only two federally-designated Hispanic Serving Institutions in the San Francisco Bay Area. The College opened in 1968, and is located in Redwood City, California. During the 2009-2010 academic year, the College enrolled 11,566 students. The student body is genuinely multi-cultural with Hispanic students as the largest single group at 39.2%; white students comprise 33.3%, Asians 8.6%, African-Americans 3.8%, Filipinos 3.6%, Pacific Islanders 1.7%, American Indian/Alaska Natives 0.4%, other 9.5%.¹ Like all of the California Community College System institutions, Cañada is an open-enrollment institution, designed to welcome students of all ages and backgrounds to higher education. Cañada's Mission is to ensure that students from diverse backgrounds achieve their educational goals by providing quality instruction. Science, Technology, Engineering, and Mathematics (STEM) students from underrepresented groups and economically disadvantaged backgrounds receive academic support services from the College's Mathematics, Engineering, and Science Achievement (MESA) Program that has been a part of

the College since 1999, and is part of the California MESA Program, a program that has received national recognition for its success.²

Nationally, community colleges are a gateway to higher education for large numbers of students, especially low-income students. Yet for many students, the community college experience does not lead to success. Only one in four students wanting to transfer or earn a degree/certificate did so within six years, according to a recent study of California community colleges.³ According to the study, only 15% of African American students and 18% of Latino students completed a degree or certificate within six years, compared to 27% of white students, and 33% of Asian students. As STEM majors, African American and Latino students have lower success and retention rates at community colleges and universities. Comprising almost 25% of the U.S. population, African Americans and Latinos make up less than 7% of the individuals with B.S. or higher-degree holders in STEM fields.⁴

In 2010 in Silicon Valley, the distribution of high school graduates meeting University of California (UC) or California State University (CSU) requirements by race/ethnicity reveals that some groups are less prepared to enter college upon graduation. Only 24% of Latino and African American graduates met UC/CSU requirements compared to 68% of Asians and 52% of Whites.⁵ This preparation gap is reflected in the results of the Cañada College's math placement tests over the last four years. Only 6% of African Americans and 8% of Mexican Americans are qualified to begin Trigonometry or higher when they arrive at Cañada College as compared to 21% of Caucasian and 23% of Asian American students.

Although nationally interest in science and engineering is lower for Latino, African American, and Native American students compared to other ethnic groups,⁶ this is not the case at Cañada College. Table 1 summarizes the percentages of students taking the Cañada College math placement test and declaring STEM majors for the four largest ethnic groups for the last four years. Although Mexican Americans represent only 37.2% of all students who took the test, they represent 38.9% of students who declared a STEM major, and 46.2% of students declaring an engineering major.

Percentage of students who:	Mexican American	Caucasian American	Asian American	African American	Other
Took the Math placement test	37.2%	30.2%	5.7%	6.4%	20.5%
Declared STEM majors	38.9%	30.1%	6.9%	4.6%	19.5%
Declared Engineering majors	46.2%	27.8%	4.1%	3.6%	18.3%

Table 1. Summary of ethnic distribution of students who took the placement test, who declared STEM majors and who declared an Engineering major (April 2006-April 2010; 6,300 students).

Despite their interest in engineering, Mexican Americans represented only 19.4% of all students who transferred to a four-year school as engineering majors from 2005-2010 while African Americans were 0.9% of the engineering transfer students. In 2008, to help improve the success

of these underprepared students, Cañada College applied for, and was awarded a National Science Foundation Scholarships in Science, Technology, Engineering, and Mathematics (NSF S-STEM) grant. The scholarship program will provide a total 140 scholarship awards of \$3000 to \$4000 per year for the five-year period of the grant, as well as academic and student support services to all scholars in order to help them successfully complete their lower-division requirements and transfer to a four-year university in a STEM major. This paper is a description of the results of the first two years of implementation of the program.

2. Cañada College's NSF S-STEM

An analysis of student data tracked by the Cañada College MESA Program over the last several years reveals that MESA students work an average of 15-20 hours a week to cover the cost of their education. In 2008, for instance, 65% of MESA students work 16 or more hours per week and 28% of MESA students work more than 26 hours per week. Because of the need to work while going to college, combined with low placement test scores, the vast majority of these students take at least three years to complete lower-division course requirements before transferring to a four-year institution. To better serve the needs of these students, four different award levels were developed for Cañada's S-STEM program. The first three levels are to support students' three-year tenure at the College, and the fourth to support transfer. Achievement Level 1 scholarship is for students who are eligible to enroll in Trigonometry or Pre-calculus at the time of the award and have three-years of study at Cañada College before transfer. Achievement Level 2 is for students who are registered in Calculus 1, or higher, at the time of the award, and are within two years of completing their Student Educational Plans (SEP) and transferring. Achievement Level 3 is for students who are within a year of completing their lower-division study at Cañada. The Transfer scholarship is for students who have completed all coursework included in their educational plan and are transferring at the time of the award. Table 2 shows the number of awards for each achievement level.

		Number of S-STEM Awards			
Level	Amount	Year 1	Year 2	Year 3	Year 4
Achievement Level 1	\$3,000	9	10	9	9
Achievement Level 2	\$4,000	6	10	10	10
Achievement Level 3	\$4,000	6	11	11	11
Transfer	\$4,000	0	6	11	11
Total Number of Awards		21	37	41	41

Table 2: Summary of proposed amounts and numbers of awards.

The rationale for the size of the proposed M-SETS scholarship awards is based on an analysis done in May 2008 by Cañada College's Office of Financial Aid to understand the actual unmet financial need of several cohorts of MESA students.

Student Scholarship Applications and Awards

Table 3 is a summary of the results of Years 1 and 2 application cycles of Cañada's S-STEM scholarship program. For Year 1, 35 students applied, and 21 awards were given. For Year 2, 31 students applied, and 20 new awards were given. For both years, applications for scholarships were accepted during both the spring and fall semesters.

	Grant Period	
	Year 1	Year 2
Number of Applicants	35	31
Number of New Awards	21	20
% Successful Applicants	60.0%	64.5%
Number of Continuing Scholars	-	17
Total Number of Scholars	21	37

Table 3. Summary of Year 1 and Year 2 applications and awards.

Of the 21 scholars selected in fall 2009, 17 are currently active continuing scholars. Three left the program at the start of spring 2010 semester. Two of the students were disqualified due to poor academic performance, and one student left the program because his family relocated to another state. At the end of spring 2010, one student left the program due to illness. For fall 2010, 20 new awards are given bringing the total number of active scholars to 37.

Student Demographics

Table 4 is a comparison the demographics of NSF scholars for fall 2009 and fall 2010. From 2009 to 2010, the percentage of female scholars dropped slightly from 38.1% to 35.1%. The percentage of students from traditionally underrepresented ethnic groups (Hispanic, African American, American Indian, Alaskan Native, and Pacific Islander) stayed about the same, 57.1% for 2009 and 56.5% for 2010. Note that for both years, the percentage of the underrepresented students among the scholars is higher than the College's overall percentage of 46.3% for fall 2009. The percentage of first generation college student increased from 52.4% in 2009 to 59.5% in 2010. The percentage of students who are the first in their family to major in a STEM field also increased from fall 2009 to fall 2010.

Demographics	Fall 2009		Fall 2010	
	Number	%	Number	%
Gender				
Female	8	38.1%	13	35.1%
Male	13	61.9%	24	64.9%
<i>Total</i>	21		37	
Ethnicity				
Alaskan or Native A	0	0.0%	1	2.6%
African American	0	0.0%	1	2.6%
Asian	2	9.5%	6	15.4%
Caucasian	7	33.3%	7	17.9%
Hispanic	12	57.1%	20	51.3%
Other/No Response	0	0.0%	4	10.3%
First in Family to Attend College?				
Yes	11	52.4%	22	59.5%
No	10	47.6%	15	40.5%
First in Family to Study a STEM field?				
Yes	18	81.7%	32	86.5%
No	3	18.3%	5	13.5%

Table 4. Summary of student demographics of active NSF scholars in fall 2009 and fall 2010.

Student Academic Majors

Table 5 shows a summary of the distribution of the academic majors of NSF scholars. For both years, engineering majors account for more than 50% of the scholars. There are a number of factors that may have contributed to this strong representation of engineering majors in the program. The Program PI is the head of the Head of the Engineering Department, and is heavily involved in recruitment. The College has a very strong Math, Engineering, and Science Achievement (MESA) program, and many of the program's activities are related to engineering. As a result, some of the most active MESA students are engineering majors, and many of them are also heavily involved in campus student organizations. Additionally, the Engineering Department has recently been awarded federal grant funds aimed at strengthening its programs. This includes a Minority Science and Engineering Improvement Program (MSEIP) grant from the US Department of Education, an Innovations in Engineering Education, Curriculum, and Infrastructure (IEECI) grant from NSF, and a Curriculum Improvement Partnerships Award for the Integration of Research (CIPAIR) grant. The Cañada College NSF S-

STEM program team recognizes the need to increase the representation of students from other disciplines, and plans to involve more faculty from these disciplines in future recruitment efforts. As an initial step, two new faculty mentors have been added to this year's team – one from mathematics, and one from biological sciences.

Major	Fall 2009		Fall 2010	
	N	%	N	%
Astronomy	1	4.8%	0	0.0%
Biology	3	14.3%	3	8.1%
Biological Sciences	1	4.8%	5	13.5%
Chemistry	1	4.8%	2	5.4%
Computer Science	2	9.5%	1	2.7%
Mathematics	1	4.8%	3	8.1%
Aerospace Engineering	2	9.5%	1	2.7%
Architectural Engineering	1	4.8%	0	0.0%
Bio Engineering	0	0.0%	3	8.1%
Chemical Engineering	1	4.8%	2	5.4%
Civil Engineering	3	14.3%	4	10.8%
Computer engineering	2	9.5%	1	2.7%
Electrical Engineering	0	0.0%	4	10.8%
Environmental Engineering	1	4.8%	0	0.0%
Mechanical Engineering	1	4.8%	7	18.9%
Engineering	1	4.8%	1	2.7%
<i>Total</i>	21		37	

Table 5. Summary of majors of study of active NSF scholars

Student GPA and Work Hours

Table 6 shows a summary of the average student Grade Point Average and the average number of hours of work per week for the first three award semesters of the scholarship program. The average GPA of students stayed about the same from fall 2009 to spring 2010, and increased in fall 2010. The average number of hours per week that students worked decreased from 10.52 to 9.38 as many of the students were able to reduce the hours that they needed to work as a result of the scholarship. Additionally, many of these students either quit their off-campus jobs or reduced the hours they worked and replaced them with on-campus jobs as tutors or student assistants. For fall 2010, for instance, 27 out of the 37 active scholars have STEM-related jobs on campus, working as math, science or engineering tutors, laboratory assistants, or student assistants. Due to the addition of 20 new scholars in fall 2010, the average number of hours of work increased to 9.7. It is anticipated that this number will decrease by spring 2011 as students are able to work fewer hours.

	Fall 2009	Spring 2010	Fall 2010
GPA	3.30	3.29	3.43
Hours	10.52	9.38	9.70

Table 6. Comparison of average student GPA and average weekly hours of work for Fall 2009, Spring 2010 and Fall 2010.

3. NSF S-STEM Activities

Cañada College's NSF S-STEM program was designed not only to provide financial assistance to its participants but also to develop a set of activities and a support infrastructure that will help maximize student retention and success. Two important variables that are commonly believed to strongly influence the retention of students are academic and social integration as articulated by Tinto's model of college student persistence/withdrawal based on these variables.^{8,9} It is widely assumed that academic and social integration are more difficult to achieve in the community college setting because of the lack of time to participate in institutional activities that facilitate such integration.¹⁰ To enhance opportunities for the creation of academic and social integration, an approach that is of increasing popularity in community colleges is the use of learning communities. Learning communities are small groups of students who take thematically linked classes that are often interdisciplinary in order to enhance academic and social integration of students, and strengthen their cognitive skills.¹¹

In developing activities to support the academic, personal, and professional development of NSF scholars, this learning community model is adopted to provide opportunities for academic and social integration while taking advantage of existing programs and resources. These activities are supported through the College's MESA Program, and two U.S. Department of Education grants – the Minority Science and Engineering Improvement Program (MSEIP) and the Hispanic-Serving Institution College Cost Reduction and Access Act (HSI-CCRAA) grant.

Academic Support Services

Academic support services for NSF scholars include tutoring, Academic Excellence Workshops, and Study Groups for most courses in math, sciences and engineering. Many of the NSF scholars work as tutors and workshop facilitators for these courses.

Professional Meetings/Conferences

The following is a list of meetings and conferences in which NSF scholars have participated within the last year:

- 7th Annual Pacific Gas & Electric/MESA Student Leadership Conference, Berkeley, CA, Oct. 15-16

- 2010 SACNAS (Society for Advancing Chicanos and Native Americans in Science) and MAES (Mexican American Engineers & Scientists) National Conference, Anaheim, CA, Oct. 6-10
- 24-hour Hackathon – Facebook and Girls in Tech, Sept. 11-12
- University of California, Berkeley Biology Majors Fair, Sept 11
- 3rd Annual Community College Honors Research Symposium, UC Berkeley, May 1
- MESA Student Leadership Retreat at Happy Valley, Santa Cruz, CA, April 17 – 19
- American Chemical Society National Conference, San Francisco, CA, Mar. 21-22
- Society of Hispanic Professional Engineers (SHPE) Regional Leadership Conference, CalPoly San Luis Obispo, Feb. 26-28

Field Trips to Industry Sites and Universities

The following is a list of field trips attended by NSF scholars in the last year:

- UC Davis STEM Day, Nov. 7
- CalPoly San Luis Obispo Engineering Open house, Oct. 23
- Stanford Med School -- Pre-Med Leadership Workshop, Oct. 23
- SJSU Engineering Open House, Oct. 16
- SHPE Bomba Blast at Apple, Oct. 16
- UC Berkeley Engineering Tours for MESA Students, Oct. 15
- SF Society of Women Engineers – boat tour of Bay Bridge construction project, Oct 1
- SHPE Day @ SF Exploratorium, Sept. 25
- Inside Google: Diversity in Engineering & Technology, Sept 1
- Cal Day @ UC Berkeley, April 17
- SJSU Engineering Open House, April 17
- Genentech Tour: The Women in Science & Engineering (WISE) club, Feb. 25

Workshops/Seminars

- NSF Scholars' Orientation, Nov. 12
- Guaranteed 4.0 Workshop, Nov 8 and Nov 11
- Writing Personal Statements for Transfer Applications or Scholarships, Oct. 14
- Transfer Application Help – UC, CSU & Private Universities, Oct. 13
- Women in Science & Engineering Speaker: A post-doctoral researcher in organic chemistry, Oct. 4
- Transfer Agreement Guarantee (TAG) Workshop, Sept. 22, Sept 1, August 24
- Student Panel – Student to Student: Experiences in Summer Internships, Sept. 9
- Industry Speaker – Career Path from MESA to a Job! A professional Civil Engineer who works as a Transportation Engineer for the City of Menlo Park and also owns a consulting company, Sept. 2
- Financial Aid – FAFSA Help – every Tuesday the Financial Aid Office helps students complete Free Application for Federal Student Aid (FAFSA), Weekly
- The Guaranteed 4.0 Workshop, Mar. 21-22

- Speaker Panel: Women in Engineering & Science: Meet 6 scientists and engineers from a variety of backgrounds and careers, March 25
- Speaker: Careers in Genetics Counseling. Speaker from Stanford's Master's Degree program in Genetics Counseling, March 24, Nov. 23
- MESA Math Challenge: Tackle 20 math questions in 60 minutes, March 17
- Scholarship Workshop: Spring Scholarships - find out what makes a successful application, March 9
- Guest Speaker from CALTRANS (also SFSU Faculty). He will talk about opportunities for Community College Students at CALTRANS, March 4
- Student-to-Student: What is an Internship Really Like? MESA Students will share their experiences in applying for and participating in research internships, Feb. 8
- Stanford's Women in Engineering Seminars: "Real Lives Have Curves," every Thursday, Jan. 26-March 11
- Student-to-Student: Experiences as a Transfer Student at UC Berkeley, Nov. 23

The following is a more detailed description of two of the workshops developed by Cañada College's STEM Retention Specialist.

Guaranteed 4.0 Workshop

Meeting the learning needs of underserved student populations at two-year postsecondary institutions often requires providing academic and personal support for this student cohort, as well as opportunities to develop the study skills necessary for college success. As part of that effort, a pilot program based on the "Guaranteed 4.0 Learning System"⁷ was offered in the Spring Semester of 2010 for 27 students; in particular, the three-day study skills workshop combined study methods with stress and time management techniques to provide an overall framework for academic success. The Guaranteed 4.0 method has been taught at community colleges and Baccalaureate institutions nationwide, including University of California, at Berkeley, Stanford University, Northwestern University, Purdue University, University of Wisconsin, and Massachusetts Institute of Technology.

The core emphasis of the curriculum involved equipping students with strategies for classroom success: active listening skills during classroom instruction; self-efficacy and self-advocacy skills for working with college professors; and a note-taking system for classroom lecture, assigned reading and problem sets, and exams based on pre-conditions, repetition, and effecting information input. The pilot program not only included structured DVD viewings of actual Guaranteed 4.0 Learning System college seminars, but it also consisted of a variety of non-traditional elements in order to reinforce concepts introduced by the Guaranteed 4.0 method, such as a guided imagery and progressive relaxation exercise, a Vision Board activity, short classroom quizzes after each DVD chapter, and a pair-share exercise enabling participants to practice the Bullet Point method.

On Day One, students learned stress and time management techniques along with insight for maximizing learning opportunities through professors' office hours. Workbooks and thumb drives containing learning materials were distributed amongst the participants. The students were administered a pre-survey to self-assess their individual study skills that required improvement,

and the majority of students highlighted time management as a major concern; for example, in the pre-survey, 25% had indicated they spent more than 25 hours studying per week and wanted a more efficient way to study. To create a safe space for discussion, the workshop instructor synthesized those concerns with the strategies and insights found in the Guaranteed 4.0 curriculum.

On Day Two, students were required to create a “Plan for a Success” whereby they identified which courses to study for at specific times and locations using a MS Excel template. Day 2 also included lessons on Bullet Point Reading, Lecture Notes, Homework and Exams. Finally, students were then organized into dyads, given assigned reading, and instructed to apply the Bullet Point method after reading short passages; participants were encouraged to share their learning experiences with their partners, and then share their thoughts and concerns with the entire classroom. The instructor answered their questions based on the DVD curriculum, and encouraged students to continue practicing the Bullet Point method at home.

On Day Three, occurring one week after Days One and Two, the instructor organized one final classroom meeting to follow-up with students, identifying successful experiences as well as challenges and shared frustrations. A student leader was pre-selected to share his experiences using the method in his transferable math and science coursework with the other participants, in addition to his detailed Bullet Point notes, as part of an effort to bolster student self-efficacy with respect to developing new study skills. Finally, students shared their Vision Boards, a collection of images representing their personal and work values and life goals, to foster a sense of community as well as to illustrate the connection between their self-understanding and the study skills workshop. Participants were then administered a post-survey and given a list of additional campus resources (e.g. free tutorial, academic counseling).

Among the participant responses, 65% found the Plan for Success exercise to be very useful, and 70% found the DVD to be engaging. In the future, instructors might consider giving students more time to practice the Bullet Point method since many participants had indicated they needed more than one hour to practice the method within a supportive learning environment.

NSF Student Orientation

The three-hour event offers students the chance not only to meet with each other and develop a sense of community, but it also provides students with information to help them formulate accurate expectations for maintaining scholarship eligibility and working with their assigned mentors. The orientation begins by reviewing the student contract, a document students have signed before accepting the award, which highlights academic responsibilities students must keep in order to maintain their eligibility for the award. Orientation also consists of a variety of activities designed to promote community: a family photo sharing exercise that connects their personal experiences to the NSF community; group discussions around the meaningful teachers and/or mentors; and a chance to write a letter to their mentors that expresses their hopes, goals, and concerns as NSF Scholars. Finally, the orientation provides instruction for cultivating mentors in college and the workplace, helping to shape student expectations and prepare them with the skills to locate support for academic and professional development.

Outreach Activities

The following is a list of outreach activities in which NSF scholars were involved:

- Cañada College's Annual High School Engineering Design Competition, Trebuchet Design Contest, April 23
- Science and Engineering Awareness Day, March 17
- Family Science Night at Hoover School in Redwood City. Volunteer to help inspire young kids about Science and Engineering. This is a project jointly sponsored by SHPE and San Francisco Exploratorium, March 4.
- Citizen School Robotics Celebration. Come see what Redwood City middle school students have done under the inspiration of Canada Robotics Club members, Dec. 7.
- Robotics workshops for middle and high school girls participating in the Girls Engaged in Math and Science (GEMS) Program.

STEM-Related Clubs

NSF Scholars have assumed leadership positions in the following STEM-related student organizations:

- Society of Hispanic Professional Engineers
- Women in Science and Engineering
- Pre-Med/Pre-Health Club
- Robotics Club
- Science Outreach Club

NSF Scholars Mentoring Program

As a major component of the Cañada College's NSF S-STEM program student support infrastructure, a mentoring program has been developed and implemented. For the first group of 21 scholars, six faculty members were selected and assigned mentees based on their specific disciplines. For the current group of 37 scholars, seven Science and Technology Division faculty members have been selected as mentors. Faculty mentors were selected from the following academic areas: Biological Sciences (2), Chemistry (1), Engineering (2), Engineering and Computer Science (1), and Mathematics (1).

Students and mentors are paired based on academic disciplines. The scholars and their mentors meet as a group through a mentoring lunch at least once every semester. At the fall mentoring kick-off luncheon, new scholars are introduced, and students and mentors are given an orientation to the mentoring program, as well as the benefits of the program, and the expectations and responsibilities of scholars. Mentors are expected to meet with their mentees either individually or in groups throughout the semester to develop and review Student Educational Plans, to discuss academic progress and problem areas, to help devise strategies to improve student performance in their classes, to help students get connected with resources, to provide career counseling, and to help students in completing applications for transfer to a four-year university, as well as applying for scholarships and internships. At the end of each school year, students are asked to evaluate their faculty mentor to assess the mentor's ability to help them with their educational and career endeavors as well as to rate the mentor's accessibility.

Transferring students are interviewed in depth about how the program has impacted their academic and professional development.

4. Student Involvement in Program Activities

This section summarizes the results of the implementation the program undertaken during the first two years of Cañada College's NSF S-STEM program. Table 7 summarizes the participation level of students in the various program activities designed to keep them engaged. Academic support services include the Math Lab, tutoring, MESA study groups and faculty office hours in the MESA Center. On-campus workshops include resume writing, applying for scholarships, applying for internships, writing personal statements, applying for transfer, financial planning, time management, the Guaranteed 4.0 workshop, and others that are specific to particular majors.

ACTIVITIES	Number of Students Involved	
	2009 (out of 21 students)	2010 (out of 37 students)
Academic support services	21	37
Career counseling	21	37
Community building	18	29
Field trips	12	21
Internships	1	6
Meetings/conferences	14	16
Mentoring	21	37
Recruitment	15	17
Research opportunities	2	4
Seminars	5	26
STEM-related campus employment	11	22

Table 7. Summary of student involvement in program activities

To evaluate the success and effectiveness of program activities, student surveys are conducted throughout the year. Additionally, more in-depth exit interviews with transferring students are conducted at the end of each academic year. Table 8 shows a summary of student responses to the 2009-2010 year-end survey. As the table shows, student perception of the usefulness of the activities are overwhelmingly positive, with mean responses between "Useful" and "Very Useful," except for Outreach Activities. The program activity that students found to be most useful is the mentoring program.

How Useful are the following activities?

1 – Not useful at all; 2 – Somewhat useful; 3 – Useful; 4 – Very Useful	
ACTIVITIES	Average Response
Academic support services	3.45
Meetings/conferences	3.50
Field trips	3.50
Workshops/seminars	3.17
Outreach activities	2.82
STEM-related clubs	3.18
Mentoring	3.71

Table 8. Summary of student perception of usefulness of program activities determined from 17 respondents to the Spring 2010 end-of-semester survey.

Table 9 is a summary of student opinion of the usefulness of some of the events that were held over the past year. Students found all of the events useful, with all average ratings between “Useful” and “Very Useful.” The results of these student surveys are used to determine which events to develop further in the future.

How Useful are the following events?	
1 – Not useful at all; 2 – Somewhat useful; 3 – Useful; 4 – Very Useful	
EVENT	Average Response
Pre-Med & Public Health Conference	3.33
MESA field trip CalPoly Engineering	3.80
PG&E/MESA Student Leadership Conference	3.83
Engineering & Science Awareness Day	3.40
Touring Apple Co.	4.00
SHPE Regional Leadership Conference	4.00
MESA Student Leadership Retreat @ Happy Valley	3.50
MESA Math Challenge	3.50
Lynn Belingheri & Transfer Admission Guarantee (TAGs)	3.82
The Guaranteed 4.0 Workshop	3.73
American Chemical Society National Conference	3.67
MESA Alumni panel	3.75
Genetic Counseling Workshop	4.00

Table 9. Summary of student perception of usefulness of program events.

5. Student Self-Reported Impact on Personal Efficacy

The following is a summary of student-reported impact of receiving a scholarship on their personal efficacy.

- Winning the scholarship encouraged me to keep going and it boosted my confidence.
- Winning a Scholarship showed me that I'm doing well at school and I should keep it up to get more scholarships.
- My confidence was greatly increased. I have always felt that scholarships were reserved for godly students, but I know now that anything is achievable.
- Winning the scholarship showed me that there is help and support to achieve my goals
- I was able to set in my mind that achieving my academic goal not only had to do with doing well in classes but also with building a supportive community where everyone was enthusiastic and eager to learn and that's why I maintained my participation with the Society of Hispanic Professional Engineers, the American Chemical Society (ACS) and Phi Theta Kappa, organizations that provided different venues and resources to explore my interests.
- It was the first scholarship I applied for and once I got that one, it gave me confidence that I don't have to be a 4.0 student to actually get money....although being a 4.0 won't hurt.
- Receiving this scholarship has aided in my confidence when it comes to applying for other scholarships
- It impacted my confidence a lot by helping me to feel supported in my pursuit towards my academic goals as well as to know that there are people who care about my education.
- With the NSF scholarships consistent checks each semester, I feel confident that I can spend more time on my school work than I could have if I had not received it. It gives me confidence in having enough time to get the grades that I need to get into the schools that I am interested in. Also, it reminds me that people are there supporting my goals.
- It has given me confidence and encouragement in continuing my goals and also drives me to keep improving.
- Winning this scholarship gave me a lot more confidence in myself.
- The NSF scholarship empowered me to dream big, because I knew that there are people like in the NSF that want to help students.
- The NSF scholarship has given me the confidence that I can achieve anything.
- This scholarship means a whole lot to me. This is the driving force I need to motivate myself to continue and to pursue my dream as a chemical engineer
- It has encouraged me more to work harder.

6. Conclusion

The first two years of implementation of Cañada College's NSF S-STEM program show success in achieving the primary program goals of providing an opportunity for low-income students to focus on their studies and fully benefit from a student support infrastructure that promotes

academic excellence, leadership skills, and professional and personal growth among students. The success of the program thus far may be partly attributed to a well planned set of activities designed to create a learning community among scholars. Participation among scholars in these program activities has been high, and most of the activities were perceived by participants to be valuable, with the mentoring program being rated by students as the most useful activity. Crucial to the success of the program are strong collaborative relationships among program personnel that include the MESA Director, Financial Aid Office personnel, academic counselors, and faculty mentors from the main STEM disciplines. Successful implementation of program activities also involved alumni, student organizations, and partners from industry, four-year institutions, local high schools, and professional organizations. The program has also leveraged resources from the College's strong MESA Program, as well as two student support programs funded by the US Department of Education – the Minority Science and Engineering Program (MSEIP), and Hispanic-Serving Institution College Cost Reduction and Access Act (HSI-CCRAA) grant.

Among the program focus areas for the next year include greater involvement of students in paid STEM-related internships, integration of service-learning components in program activities, and development of more targeted recruitment strategies to attract more incoming freshmen students from underrepresented groups. Another area of focus is sustaining program activities to support student success beyond the duration of the grant.

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