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Enhancing the Success of Minority STEM Students by Providing Financial, Academic, Social, and Cultural Capital

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Abstract

Research has shown that student achievement is influenced by their access to, or possession of, various forms of capital. These forms of capital include financial capital, academic capital (prior academic preparation and access to academic support services), cultural capital (the attitudes, knowledge, and behaviors related to education which students are exposed to by members of their family or community), and social capital (the resources students have access to as a result of being members of groups or networks). For community college students, many with high financial need and the first in their families to go to college (especially those from underrepresented minority groups), developing programs to increase access to these various forms of capital is critical to their success. This paper describes how a small federally designated Hispanic-serving community college has developed 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. Developed through a National Science Foundation Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM) grant, the program involves a collaboration among STEM faculty, college staff, administrators, student organizations, and partners in industry, four-year institutions, local high schools, and professional organizations. In addition to providing financial support through the scholarships, student access to academic capital is increased through an intensive math review program, tutoring, study groups, supplemental instruction, and research internship opportunities. Access to cultural and social capital is increased by providing scholars with faculty mentors; engaging students with STEM faculty, university researchers, and industry professionals through field trips, summer internships, professional organizations, and student clubs; supporting student and faculty participation at professional conferences, and providing opportunities for students and their families to interact with faculty and staff. The paper details the development of the program, and its impact over the last five years on enhancing the success of STEM students as determined from data on student participation in various program activities, student attitudinal and self-efficacy surveys, and academic performance including persistence, retention, transfer and graduation.

1. Introduction

A 2012 report prepared by the President's Council of Advisors on Science and Technology (PCAST) indicates that the United States needs to produce one million additional STEM professionals in the next decade in order to retain its historical preeminence in science and technology.[1] The report proposes that addressing the retention problem in the first two years of college is the most promising and cost-effective strategy to address this need. The California Community College System, with its 112 community colleges and 71-off campus centers enrolling approximately 2.6 million students—representing nearly 25 percent of the nation's community college student population—is in a prime position to help address the need for the future STEM workforce.[2]

Recent reports on student achievements at California community colleges show disappointing results. Key findings indicate that only one in four students wanting to transfer or earn a degree/certificate did so within six years.[3] African American and Hispanic students have even lower rates of completion; only 14% of African American students and 20% of Latino students completed a degree or certificate within six years, compared to 29% of white students, and 24% of Asian students. These low success and completion rates among underrepresented students at community colleges are even more crucial since almost three-fourths of all Latino and two-thirds of all African-American students who go on to higher education begin their postsecondary education in a community college.[4]

Previous research has suggested that student achievement is influenced by their access to, or possession of, various forms of capital. These forms of capital include financial capital, academic capital, cultural capital, and social capital.[5] Increasing access to these forms of capital using high-impact practices can significantly enhance student success, especially those from underrepresented minority groups.[6] Financial capital (in the form of scholarships and financial aid) is important to many community college students from economically disadvantaged backgrounds who may need to work while attending college. In fact over 80 percent of Community College students work while attending school.[7] The lack of academic capital among community college students is evidenced by the fact that about 60% of them start college needing remedial work,[8] and only about one quarter of these students go on to earn any degree or certificate within 8.5 years.[9]

Social capital consists of the resources a student has access to as a result of being a member of a group or network—the more developed and prestigious one's social network, the more social capital they have.[10] Social capital provides information channels, relies on trustworthiness and a sense of obligation, and operates within normative structures.[11] An increase in one's social capital increases the chances of return but an individual's location within a specific social network influences the quantity and/or quality of resources that can be accessed.[12] When disadvantaged groups, particularly minorities and women, participate in homogeneous networks, their capital tends to be reduced. Therefore, gaining higher status requires strategic access to wide (or dominant) circles.[12] Within STEM education, increasing one's social capital means establishing and maintaining contacts with important and influential people in the field.[13]

Cultural capital pertains to the attitudes, knowledge, and behaviors related to education which students are exposed to by members of their family or community.[5] Cultural capital also includes verbal facility, general cultural awareness, and in information about and ability to navigate the educational system.[14] It is related to social capital, is field specific, and can often influence one's social capital. Students with little social and cultural capital such as most underrepresented students need to be introduced to college academically, socially, emotionally, and culturally.[15]

This paper is a description of how Cañada College developed a program to promote the success of academically talented financially needed and academically disadvantaged community college STEM students by enhancing student access to the various forms of capital that enhance student success. Developed through a National Science Foundation Scholarships in Science, Technology, Engineering, and Mathematics (NSF S-STEM) grant, the program provided

scholarship awards as well as academic and student support services to promote student success in STEM.

2. Cañada College's NSF S-STEM Program

Building Financial Capital

Cañada College**,** a member of the California Community College System, is a federally-designated Hispanic-Serving Institution in the San Francisco Bay Area. During the 2012-2013 academic year, the College enrolled 10,271 students, with Hispanic students comprising 45.8%, Caucasians 30.4%, Asians 7.6%, African-Americans 3.7%, American Indian/Alaska Natives 0.3%, Filipinos 3.1%, Pacific Islanders 1.8%, multi-racial 2.9%, unknown 4.5%.[16] Approximately 20.3% attend college full time. Like all California community colleges, Cañada College is an open-enrollment institution, designed to welcome students of all backgrounds to higher education.

Despite high interest in engineering among underrepresented students at Cañada College as indicated by their declared majors, success and transfer rates are low.[17] In 2008, to help improve the success of these underprepared students, Cañada College applied for and received a National Science Foundation Scholarships in Science, Technology, Engineering, and Mathematics (NSF S-STEM) grant. The scholarship program provided a total of 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.

An analysis of student data tracked by the Cañada College MESA (Mathematics, Engineering, and Science Achievement) 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 1 shows the number of awards for each achievement level.

Table 1. Summary of proposed amounts and numbers of awards.

		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

Building Academic Capital

Insufficient academic support is another barrier to student success. To help overcome this barrier, Cañada College has developed a number of academic support programs for STEM students including tutoring, Academic Excellence Workshops, study groups, peer instruction, and research internship opportunities. Many of these support services have been previously developed through the MESA Program. Other programs were developed through grant-funded projects that led to the creation of Cañada College's STEM Center, a campus hub for all STEM-related programs, activities, and support services. The STEM Center provides academic support services that have been shown to be effective strategies in increasing academic success and persistence.[6,18] Among grant-funded initiatives developed to help build academic capital among underrepresented STEM students are: Math Jam, Physics Jam, NASA CiPair (Curriculum Improvement and Partnership Awards for the Integration of Research) Internship Program, and Supplemental Instruction. Math Jam is an intensive review program originally designed to help students prepare for the math placement test. It has been very successful in helping students skip math courses and improve student retention and success.[19] Physics Jam is a self-paced program designed to familiarize students with college-level physics topics and valuable physics educational resources.[20] The NASA CiPair Internship Program is a 10-week summer research internship program for community college engineering students wherein groups of three to four students work on a research project under the supervision of a university faculty and a graduate student mentor. The program has been shown to increase student self-efficacy for success in a four-year institution and interest in pursuing advanced degrees.[21] Supplemental instruction (SI) is an academic assistance program that creates a safe environment for students to get their questions answered and receive feedback from peers who have been successful in their course.

Another academic support program developed to help students develop the study skills necessary for college success is the Guaranteed 4.0 Workshop. This three-day study skills workshop based on the "Guaranteed 4.0 Learning System[22]" was piloted in the spring semester of 2010. 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 program included not only 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.

Building Cultural and Social Capital

In addition to providing academic and financial support, Cañada College's S-STEM program also implemented activities to enhance student access to cultural and social capital. These program activities include: professional society meetings/conferences, field trips to industry sites and universities, on-campus workshops and seminars, and a mentoring program.

The following is a list of meetings and conferences in which NSF scholars have participated within the last year: Society of Hispanic Professional Engineers (SHPE) SHPE Bomba Blast, SACNAS National Conference, American Chemical Society Regional Conference, GRADD Conference at UC Berkeley, Geoscience Field Conference, SHPE Engineering Regional Leadership Development Conference, American Society for Engineering Education Pacific Southwest Section Conference, MESA Student Leadership Retreat. Field trips to industry sites and universities include: University of California Davis STEM Day, Pre-med Workshop at Stanford School of Medicine LEAP program, CalPoly San Luis Obispo Engineering open house, San Jose State University Engineering open house, University of California, Berkeley Engineering MESA Day, San Francisco Society of Women Engineers Bay Bridge tour, SHPE Day at the San Francisco Exploratorium, and Cal Day at University of California, Berkeley. On-campus workshops and seminars include: Transfer Day, Personal Statement Workshop, Transfer Application Workshop, Transfer Agreement Guarantee (TAG) Workshop, Student Panel: Summer Internships, Money Management Workshop, MESA California Connects Ambassador Launch Celebration, NSF Scholars Mentoring Lunch, and NSF Scholar Orientation Workshop. STEM-related clubs on campus include: Society of Hispanic Professional Engineers, Women in Science and Engineering, Pre-Med/Pre-Health Club Robotics Club, Math Club, and Computer Science Club.

As a major component of the Cañada College’s NSF S-STEM program student support infrastructure, a mentoring program has been developed and implemented. Eight Science and Technology Division faculty members were selected as mentors for the scholars. Students and mentors were 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 the 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.

3. Results

Student Scholarship Applications and Awards

Table 2 is a summary of the results of the application cycles for each of the award years. For Year 1, 35 students applied, and 21 awards were given. For Year 2, 31 students applied, and 20 new awards were given. Year 3 is the most competitive scholarship application year with 62 students competing for 21 new awards. For Year 4, 45 students applied, and 20 new awards were given. Year 5 (2013-2014) is an award year that is beyond the original proposal. No new awards were given in Year 5 but 22 continuing awards were given in fall 2013, and continue into spring 2014.

The total number of scholarships awarded at the end of the grant will be significantly higher than what was originally proposed (164 vs. 140). This is due a combination of factors. First, the part of the funds originally budgeted for a Math Instructional Aide has been freed as a result of Cañada College's new grant initiative funded by the US Department of Education through the Hispanic-Serving Institution Science, Technology, Engineering, and Mathematics (HSI STEM) grant program. Additionally, a few of the scholars have unmet needs that are slightly below the $3,000 or $4,000 amount corresponding to their award level. Finally, the project team was able to secure additional funding of over $7,000 to supplement the remaining funds and continue funding all the current active scholars.

Table 2. Summary of applications and awards for the five-year period of the program.

	Grant Period				
	2009-10	**2010-11**	**2011-12**	**2012-13**	**2013-14**
Number of Applicants	35	31	62	45	-
Number of New Awards	21	20	21	18	-
% Successful Applicants	60.0%	64.5%	33.9%	40.0%	-
Number of Continuing Scholars	-	17	21	24	22
Total Number of Scholars	21	37	42	42	22

Student Demographics

Table 3 is a comparison the demographics of active NSF scholars for fall 2009, fall 2010, fall 2011, and fall 2012. The percentage of female NSF scholars has stayed between 35% and 40%. 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, and decreased to 47.6% for 2011, and increased to 52.4% in 2012. Note that for each year, the percentage of the underrepresented students among the scholars is higher than the College's overall percentage of about 46%. The percentage of first generation college student increased from 52.4% in 2009 to 59.5% in 2010, 71.4% in 2011, 66.7% in 2012, and 77.3% in fall 2013. The percentage of students who are the first in their family to major in a STEM field has stayed above 75% for each year.

Table 3. Summary of student demographics of active NSF scholars.

	Fall 2009		**Fall 2010**		**Fall 2011**		**Fall 2012**		**Fall 2013**	
Demographics	No.	%	No.	%	No.	%	No.	%	No.	%
Gender										
Female	8	38.1%	13	35.1%	17	40.5%	15	35.7%	8	36.4%
Male	13	61.9%	24	64.9%	25	59.5%	27	64.3%	14	63.6%
Total	21		37		42		42		22	
Ethnicity										
Alaskan or Native A	0	0.0%	1	2.6%	0	0.0%	0	0.0%	0	0.0%
African American	0	0.0%	1	2.6%	1	2.4%	3	7.1%	3	13.6%
Asian	2	9.5%	6	15.4%	11	26.2%	7	16.7%	4	18.2%
Caucasian	7	33.3%	7	17.9%	8	19.0%	9	21.4%	3	13.6%
Hispanic	12	57.1%	20	51.3%	18	42.9%	17	40.5%	10	45.5%
Pacific Islander	0	0.0%	0	0.0%	0	0.0%	2	4.8%	1	4.5%
Other/No Response	0	0.0%	4	10.3%	2	4.8%	4	9.5%	1	4.5%
First in Family to Attend College?										
Yes	11	52.4%	22	59.5%	30	71.4%	28	66.7%	17	77.3%
No	10	47.6%	15	40.5%	12	28.6%	14	33.%	5	22.7%
First in Family to Study a STEM field?										
Yes	18	81.7%	32	86.5%	36	85.7%	33	78.65	17	77.3%
No	3	18.3%	5	13.5%	6	14.3%	9	21.4	5	22.7%

Student Academic Majors

Table 4 shows a summary of the distribution of the academic majors of NSF scholars. For all three years of the program, 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 Engineering Department, and has been 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.

Table 4. Summary of majors of study of active NSF scholars

	Fall 2009		Fall 2010		Fall 2011		Fall 2012		Fall 2013	
Major	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	%
Astronomy	1	4.8%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Biology	3	14.3%	3	8.1%	4	9.5%	2	4.8%	1	4.5%
Biological Sciences	1	4.8%	5	13.5%	6	14.3%	5	11.9%	4	18.2%
Chemistry	1	4.8%	2	5.4%	2	4.8%	1	2.4%	1	4.5%
Computer Science	2	9.5%	1	2.7%	3	7.1%	5	11.9%	2	9.1%
Mathematics	1	4.8%	3	8.1%	3	7.1%	3	7.1%	1	4.5%
Aerospace Engr	2	9.5%	1	2.7%	1	2.4%	1	2.4%	1	4.5%
Architectural Engr	1	4.8%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Bio Engineering	0	0.0%	3	8.1%	3	7.1%	2	4.8%	1	4.5%
Chemical Engr	1	4.8%	2	5.4%	1	2.4%	0	0.0%	0	0.0%
Civil Engr	3	14.3%	4	10.8%	4	9.5%	6	14.3%	3	13.6%
Computer Engr	2	9.5%	1	2.7%	4	9.5%	4	9.5%	3	13.6%
Electrical Engr	0	0.0%	4	10.8%	4	9.5%	4	9.5%	1	4.5%
Environmental Engr	1	4.8%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Mechanical Engr	1	4.8%	7	18.9%	6	14.3%	7	16.7%	3	13.6%
Engineering	1	4.8%	1	2.7%	1	2.4%	2	4.8%	1	4.5%
Total	21		37		42		42		22	

Student Involvement in Program Activities

Table 5 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 résumé 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.

For the current group of scholars, the number of students involved in paid internships and research activities has increased significantly. Twenty-four of the scholars had paid summer internships, and 23 were involved in research. This is partly because of an internship program developed through NASA's Curriculum Improvement Partnership Awards for the Integration of Research (CIPAIR) program. Ten of the scholars were involved in the NASA CIPAIR Summer Internship Program, another three scholars who are also veterans were involved in a summer

internship at NASA Ames Research Center through the college's Veterans Employment-related Assistance Program (VEAP). Additionally, the program team has worked hard in collaborating with a number of universities, government agencies and research institutions to provide internships, including Stanford's Emerging Frontiers in Research and Innovation (EFRI) program (NSF Award 1136790), San Francisco State University's Bridges to the Baccalaureate program, UC Davis Center for Biophotonics, US Department of Energy CCI program, NASA Ames Research Center, San Francisco International Airport, and the City and County of San Francisco.

In addition to involvement in the above program activities, Cañada College NSF Scholars have assumed leadership positions in the college's student academic organizations, with many other NSF scholars actively involved.

Table 5. Summary of student involvement in program activities

	Number of Students Involved				
Activities	2009 (out of 21 students)	2010 (out of 37 students)	2011 (out of 42 students)	2012 (out of 42 students)	2013 (out of 22 students)
academic support services	21	37	36	40	14
career counseling	21	37	42	42	22
community building	18	29	20	27	10
field trips	12	21	17	19	9
Internships	1	6	12	24	14
meetings/conferences	14	16	16	18	11
Mentoring	21	37	42	42	22
Recruitment	15	17	13	13	7
research opportunities	2	4	13	23	16
Seminars	5	16	13	18	9
Other (Community Service)	0	0	34	34	19

Student Evaluation of Program Activities

Table 6 shows a summary of student responses to the year-end survey that was designed to evaluate the success and effectiveness of the various program activities. As the table shows, student perceptions of the usefulness of the activities are overwhelmingly positive, with mean responses between "Useful" and "Very Useful." In general, student opinions are more positive in spring 201, 2012, and 2013 than in spring 2010, perhaps an indication that the programs and activities are improving in meeting the needs of the students. Significant improvements in student perceptions of the activities are observed for academic support services, field trips, workshops/seminars, outreach activities, and STEM-related clubs. The mentoring program continues to be valued as being very useful by a majority of the students.

Table 6. Summary of student perception of usefulness of program activities as determined from end-of-year student surveys.

How Useful are the following activities? 1 – Not useful at all; 2 – Somewhat useful; 3 – Useful; 4 – Very Useful				
ACTIVITIES	**Average Response**			
	Spring 2010	Spring 2011	Spring 2012	Spring 2013
Academic support services	3.45	3.70	3.67	3.67
Meetings/conferences	3.50	3.50	3.61	3.62
Field trips	3.50	3.70	3.45	3.55
Workshops/seminars	3.17	3.42	3.39	3.59
Outreach activities	2.82	3.14	3.09	3.48
STEM-related clubs	3.18	3.26	3.30	3.44
Mentoring	3.71	3.67	3.74	3.67

Student GPA and Work Hours

Table 7 shows a summary of the student average Grade Point Average and the average number of hours of work per week for each of the award semesters of the scholarship program. A comparison of the fall semester average GPA shows an increasing trend, perhaps an indication of the increasing competitiveness of the scholarship applications. A similar trend is observed in the spring semester average GPA. The average number of hours per week that students worked decreased from 10.52 to 9.38 during the first two semesters of the scholarship program. However, for the last seven semesters, the average number of work hours has been increasing steadily, perhaps an indication of tough economic times as the cost of living continues to increase. An encouraging development, however, is that an increasing number of the student work hours are spent on campus, either working as a tutor or a student assistant.

Table 7. Comparison of average student GPA and average weekly hours of work.

	Fall 09	**Spr 10**	**Fall 10**	**Spr 11**	**Fall 11**	**Spr 12**	**Fall 12**	**Spr 13**	**Fall 13**
GPA	3.30	3.29	3.43	3.39	3.49	3.45	3.51	3.48	3.44
Hours	10.52	9.38	9.7	9.78	10.88	13.84	11.19	15.93	14.00

Student Completion of Program and Transfer

Table 8 summarizes the results of the academic success of the scholars. Except for the first semester of the program, the retention rate of students in the program has been above 93%. Students who were not retained left for a variety of reasons in addition to poor academic performance including health problems, change of major, transfer to another community college, and relocation. Among students who have completed the Level 3 awards, 100% have transferred

as STEM majors to some of the best four-year universities in California including UC Berkeley, UCLA, California Polytechnic University at San Luis Obispo, UC Davis, UC San Diego, UC Irvine, UC Santa Cruz, San Jose State University, and SF State University. Of the 81 students who have been part of the program, 50 have successfully transferred to a four-year university, 11 more than was originally projected in the proposal. The rest are still at CC and are on track to transfer in fall 2014. Of the 50 students who have transferred, 15 have received their BS degrees, and 20 more are expected to graduate in the next academic year.

Table 8. Summary of scholar retention rates and successful student transfers.

Semester	Retention Rate	Projected Transfers	Actual Transfers
Spring 2010	76.2%	-	-
Fall 2010	100%	6	6
Spring 2011	94.7%	-	-
Fall 2011	93.8%	11	17
Spring 2012	93.8%	-	-
Fall 2012	93.1%	11	13
Spring 2013	93.3%	-	-
Fall 2013	-	11	14

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 then 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."

4. Conclusion

The implementation of Cañada College's NSF S-STEM program shows success in enhancing student access to financial, academic, social and cultural capital needed for academic success in a STEM disciplines. The program has achieved its 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 may be 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, STEM Center staff, 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 other federally grant-funded student support programs– the Minority Science and Engineering Program (MSEIP) and the Hispanic-Serving Institution Science STEM grants funded by the US

Department of Education, and the NASA Curriculum Improvement and Partnership Award for the Integration of Research (CIPAIR).

Future plans for the program include strengthening the mentoring program by providing professional development for faculty mentors, and increasing family involvement with faculty and staff through an annual retreat and research symposium. Additionally, a more thorough evaluation of the program will be developed to determine which program components have the most significant impact on student success.

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