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Some Highlights of SESMC: Scholarships in Engineering, Science, Mathematics, and Computer Science – National Science Foundation S-STEM Project

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Introduction

Scholarships in Engineering, Science, Mathematics and Computer Science (SESMC, "seismic") is an NSF S-STEM project at Allan Hancock College (AHC), a community college in Santa Maria, California. SESMC was funded at $600,000 for five-years. The first set of scholarships was awarded during academic year 2013–14, and the final set was awarded during 2017–18.

Project activities were based on four foundations blocks: *Financial*, *Academic Skills*, *Involvement*, and *Commitment/Motivation* (Figure 1). Each scholar was awarded up to $6,000 per year. Scholars were required to attend group study sessions, workshops, guest speaker talks, etc., as well as meet twice per semester with a faculty mentor in their discipline (or in a related discipline). Scholars were provided field trip opportunities, were encouraged to apply for internships, and were provided with a membership in a professional organization (e.g., ASME, IEEE).

This poster will present three elements and activities of the SESMC program, and an initial analysis of student response to each. These elements include:

1. Reduction in working hours.
2. Winter Reading Activity
3. Meetings with Faculty Mentors

A summary of the scholar status at the end of the project period is also presented.

Financial Support

The intent of SESMC project is to aid academically talented but financially challenged AHC students prepare to successfully transfer to a four-year institution in a STEM discipline. SESMC Scholars are awarded scholarships of up to $6,000 per academic year, half distributed each semester.

From surveys administered each semester by AHC's engineering instructor since 2002, it was found that the average sophomore-level engineering student worked approximately 20 hours per week, while taking at least 12 units. The SESMC scholarship thus provided an excellent opportunity to shift student time committed to working to time committed to studying.

One of the project's stated objectives was: "SESMC scholars will reduce their average of 20 hours per week working by at least 50%." The amount of the $6,000 was determined by calculating what a student would make working 20 hours per week over two semesters at minimum wage ($8 per hour in California at the time of grant-writing). At the orientation meetings at the beginning of the fall and spring semesters, scholars were informed how the scholarship amount had been determined, with a message that the program was paying scholars to do what they wanted to do – attend school and develop themselves into successful STEM students. In addition, it was also made clear that students face real-life challenges and that the program did not prohibit students from working. However, it was recommended that students

seek jobs on campus, or off-campus jobs that were related to their major, and minimize work hours as much as possible.

Data concerning work hours was gathered at several points in time: (1) on the SESMC application; (2) on the scholar-awardee in-take form at the Fall Orientation; (3) on the Spring Orientation survey; (4) on the end-of-the-year survey; and (5) on the Record of Activities sheet that scholars turn in at the end of each semester. On the applications (1), applicants were asked how many hours they worked per week. On the in-take form (2), awarded scholars were asked how many hours they intended to work, and how many hours they would need to work without the SESMC scholarship. At the end of each semester, students turn in a Record of Activities (5), which asks how many hours they actually worked, and how many they would have worked without SESMC. These two questions were repeated at the beginning of Spring semester (3) as a check on fall's report. The end-of-year summary survey (4) serves as a check of the Spring Record of Activities. The end-of-year survey is the primary data source.

Table 1 shows the average reduction in work hours reported in 65 end-of-year SESMC Surveys (May 2014, 2015, 2016 and 2017). The average of 20 working hours per week needed to work without SESMC is consistent with pre-grant surveys.

Table 1. Reduction in Weekly Work Hours.

Average hours/week would have worked without SESMC	20.1
Average hours/week worked with SESMC	8.7
Average reduction in weekly work hours	**11.4 (57%)**

A work-reduction in 11 hours per week can have significant impact on a student's ability to succeed. Nearly two-days – outside of normal class time – can now be dedicated to study and academic community-building.

At the spring orientation meetings (three separate meetings were held in Spring 2018 to accommodate student schedules), scholars were asked in a survey: "What has the SESMC Scholarship allowed you to do (or not do) during Fall 2017?" A few representative answers follow:

- "This scholarship has allowed me at least 25 extra hours to study more and not be as stressed." [35 to 10 work hours/week]
- "It has allowed me to put in the time necessary to succeed in my classes. It has allowed me to have time to seek out necessary tools [to succeed]." [30 to zero work hours/week]
- "The scholarship has allowed me not to work as much and to spend the time studying instead." [20 to 10 work hours]
- "I was able to not work which let me focus on school. It also made me work harder in order to pass my classes and stay in scholarship." [30 to zero work hours]
- "I was able to schedule in activities for self-improvement." [15 to 0 work hours].
- "I was able to purchase my books on time." [30 to 20 hours]

Common purchases with the funds include laptops, textbooks, rent, food, gasoline and reliable transportation.

Winter Reading Project

In Year 4 (2016–17) the SESMC group nearly doubled, from 15 the previous year to 29. The increased group size came with more challenges for the scholars themselves. Nine withdrew or received sub-par grades (D, F) from key STEM courses during Fall 2016 (as opposed to only 1 in previous smaller cohorts of 15 to 16 students.

Student progress was monitored during Fall 2016, and in preparation for a less successful semester, a new activity was introduced for winter break 2016–17. SESMC purchased the book *Mindset: the New Psychology of Success*, by Carol S. Dweck [1]. This book was assigned as reading over the winter break and was the primary topic of discussion at the Spring 2017 orientation meeting. The intent was to provide students with perspective when met with new challenges, and tools to deal with them. Some key takeaways that students received from reading *Mindset* and from the subsequent group discussions:

- "Failing is not a reflection of my self-worth, it is merely an opportunity for improvement."
- "After reading this book I spent some time reviewing my algebra. After having to drop calculus last semester, I doubted my math abilities. But this book helped me really find what I was doing wrong instead of why I am not capable."
- "You are here to learn, you aren't here just to get high marks."

Students were asked in the end-of-year survey how useful various SESMC activities and other STEM support activities were to them. The choices were "Very Useful", "Useful", "Somewhat Useful" and "Not Useful". The results for the winter reading are shown in Table 2:

Table 2. Usefulness of Winter 2016–17 Reading Assignment (n = 25).

Activity	Very Useful	Useful	Somewhat Useful	Not Useful
Winter Reading Assignment: *Mindset* (Dweck)	20 (80%)	5 (20%)	0 (0%)	0 (0%)
Spring Orientation and *Mindset* Discussion	20 (80%)	5 (20%)	0 (0%)	0 (0%)

The winter break 2017–18 reading assignment was Leaner and Schelchter's *UThrive: How to succeed in College (and Life)* [2]. This book was written in a very accessible manner, and (with periodic email reminders to read the book), it seemed that all scholars actually read the entire book during winter break.

Some takeaways students reported in the Spring 2018 orientation meeting:

- "Pg 242 'No replacement for hard work, and deliberate practice is key to your becoming your very best' I like this because it shows that no matter where you are born, how much money you have, how you look, you will succeed if you put in the hours and work towards being the best."
- "it talks about will power. It helped me realize that every useless or pointless thing I do exhausts it little by little so when I finally get to doing something important (homework/studying), I'm too exhausted to try."
- "Positive thinking can make a huge difference in the outcome of what you do. I really like how the book related all topics to many different aspects of life. The mood you go into an exam, competition or performance really does make a difference on how well you will perform."
- "I realized that last year I was a very pessimistic person and it took a toll on me emotionally and academically. Now I can think to myself how can I approach a negative problems and thoughts in a better way."
- "I need to have more will-power and a mindset that enables growth."
- "The blue light emissions from the electronic screens was interesting. I tried not using my phone before bed and I slept a lot better. I didn't even know the blue light wasn't good. Sleep is important."
- "Required reading helped me grow."

Students responded well to this reading assignment.

Faculty Mentoring

Each SESMC Scholar has a faculty mentor in his/her discipline (or in a related discipline). Faculty Mentors meet with each scholar at least twice per semester. The goals are to help students connect to their profession my getting academic and professional advice from someone who has been along the same path that they are pursuing. Some students wanted to select an academic counselor or instructional faculty who they personally connected with but was not in the same discipline. However, a counselor does not generally have a STEM master's degree. And with six biology faculty instructors available, a biology student should not necessarily have a math faculty as mentor. These students were generally directed to select an instructional faculty in their discipline, reminding them that the mentor should be someone who could help them grow in their discipline.

Professional Development for mentors has been minimal (at least 90% of grant funds must be used for student scholarships). There have been no formal trainings. However, the P.I. has provided mentors with pertinent YouTube links during the project period. In Fall 2016, SESMC purchased for each mentor *On Being a Mentor: A Guide for Higher Education Faculty* (Johnson, 2016) [3]. In Fall 2017, On *Being a Mentor* book was given to new mentors. Additionally, the scholars' winter reading, *UThrive*, was also given to each in mentor in Fall 2017.

Scholars have reported positive experiences with their mentors. While scholars must meet with their mentor at least twice per semester, in the 2017 end-of-year orientation survey, five scholars

(20%) indicated that they met with their mentor six or more times during the academic year. Three comments about the mentoring experience:

- "Having a mentor guide me during my time here has given me insight that I otherwise would be oblivious too. He has been a great resource for further academic goals and a dependable person I can rely on in times of hardship."
- "Another way [SESMC] helped was the mentor meetings. These meetings … help substantially, because we get advice and support from them in these meetings. In these meetings I talked to my mentor about transferring, college life, adult life, the engineering industry and things about my personal life. In each of these areas, my mentor has given me advice and eased my worries with his words. He's been a huge help to me in my personal life and academic career."
- "I feel the mentor program helps me because I have someone who has experience in the engineering field who can guide me in the right direction, not just academically but in my personal life as well."

A summary of the 2016–17 scholars mentoring experience is given in Tables 3 and 4

Table 3. Which of the following items/topics did you discuss with your mentor (*n* = 25).

Topic	Number
Study/work skills	22
Your performance in your classes	21
Transfer	21
Career Planning/Advising	18
Internships	15
Scholarships	14
Student Education Plan (semester schedule	11
Resources on Campus tutoring, health services, MESA, financial aid, etc.	9
Other (write-in): Work/Resumes; Parenting, Life Balance; Stress Management; Transferring out of state; General Pep-talk	4

Table 4. Usefulness of Mentoring Program (*n* = 25).

Activity	Very Useful	Useful	Somewhat Useful	Not Useful	No Opinion
How useful to you were your meetings with your Mentor	22 (88%)	3 (12%)	0 (0%)	0 (0%)	0 (0%)
In your opinion, how useful is the Scholar's Mentoring program?	23 92%)	1 (4%)	0 (0%)	0 (0%)	1 (4%)

Current Scholar Status

Seventy-seven unique individuals have been awarded 104 annual SESMC scholarships during the five-year grant period. As of this writing, the end-of-year status of the 2017–18 cohort has not been finalized. A summary of student scholar status (as of Week 13 of Spring 2018), is given in Table 5. The end-of-year status for the last cohort is estimated.

Table 5. Awardees, Transfers, Continuing, Withdrawals and Probations, as of March, 2017

Cohort	**1**	**2**	**3**	**4**	**5**
Award Year	**2013–14**	**2014–15**	**2015–16**	**2016–17**	**2017–18**
Continuing Awardees	n/a	5	4	7[1]	12[2]
New Awardees	16	11	11	22	16
Total Awardees	**16**	**16**	**15**	**29**	**28**
Withdrew from AHC	0	0	2 (in Fall)	0	0
Returned to AHC	0	0	1 (Spring)	0	0
On SESMC Probation					
During Fall	0	0	0	1	1
During Spring	0	0	0	5	2
End of Academic Year Status					
Transferred to 4-year	10	11	7	15	19[3]
Continued, Good Standing	5	4	5	10	n/a
Continued, Probation	0	0	1	1	n/a
Ended 2-year award in Good Standing, continued at AHC	n/a	1	1	1	7[3,4]
Voluntarily Withdrew from Program	1	0	1	0	0
Lost Eligibility and Removed from Program[4]	0	0	0	2	2[3]
Successful (Transfer, Continued in Good Standing, Ended in Good Standing)	**15/16** (94%)	**16/16** (100%)	**13/15** (93%)	**26/29** (90%)	**26/28**[3] (93%)

[1] Including one awardee previously awarded in Cohort 1 and 2.
[2] Including one spring-only awardee previously awarded in Cohort 2 and 3.
[3] Estimate as of Week 13, Spring 2018.
[4] Approximately 5 of 7 received one year (or one semester) of funding, and would have received funding in Fall 2018 if the grant continued into 2018–19.

Future Work

At the end of Spring 2018 and into summer 2018, a detailed analysis will be performed on the outcomes of the SESMC grant, which will have formally ended in April 30, 2018. Such analysis

will include, but will not be limited to: success rates in key STEM classes compared to other students, and success in achieving academic goals such as academic degrees and transfer. A census of the students who have transferred will be conducted to determine their current academic standing or employment status.

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References

[1] C. Dweck, *Mindset: The New Psychology of Success*. New York: Random House, 2006.
[2] D. Learner and A. Schlecter, *UThrive: How to Succeed in College (and Life)*. New York: Little, Brown and Company, 2017.
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