



The S-STEM Scholarship: An Integrated Approach to Helping Talented Students in Need

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Abstract

The S-STEM Scholarship Program at Southern Utah University provides financial, faculty, peer, and professional support to first-generation college students, minority students, and students who come from low-income families. The program was initiated in response to the identification of a high percentage of SUU students with these disadvantages and to the realization that supporting these students could increase retention at SUU in the STEM disciplines. In addition, the program seeks to help provide skilled scientists, engineers, and mathematicians to the southern Utah region. Since its inception in 2012, S-STEM program participants majoring in science, engineering, and mathematics disciplines have engaged in an interdisciplinary learning community that has included faculty mentorship, peer mentorship, undergraduate research opportunities, and career and graduate school workshops. Participants have been awarded \$5000 scholarships per school year, which have allowed many to decrease their extracurricular employment responsibilities and increase their focus on their studies. These engagement and financial benefits have supported a population of students whom the university has traditionally struggled to retain. The program's goals are currently being met, and the program can serve as a model for others who wish to support students with various disadvantages. This report presents the rationale for the program, describes the details of the interdisciplinary learning community, and provides a progress report after the first 3 years of student involvement.

Introduction

Previous research supports that low-income, minority, and first-generation students are more likely to lack specific types of knowledge critical to success in college. This can include knowing how to prepare for college, how to survive financially in college, and how to make connections between career goals and their education.⁴ In addition, these students are more likely to struggle with time management and the bureaucratic operations of higher education. They face many obstacles that include a lack of knowledge of the campus environment, its academic expectations, and lack of family support.²

In accordance with these difficulties, it is not surprising that first-generation, minority, and low-income students also have lower retention rates. For example, 45 percent of first-generation students who began higher education in 1989-1990 had not obtained a degree or certificate and were no longer enrolled by 1994, compared with 29 percent of non-first-generation students.¹ In fact, students from first-generation and low-income backgrounds are among the least likely to be retained and complete a degree.²

To increase retention rates of low-income, minority, and first-generation students, institutions must address these needs. Research suggests that the most effective gains will be a result of focusing on student-environment interaction after college entry. Effective retention strategies will be “multifaceted, and will assist students in developing a sense of social security accompanied by a sense of academic competence.”³

Southern Utah University (SUU) is a public university offering graduate, baccalaureate, associate, and technical programs in the Utah Higher Education System with a student body of approximately 8000 students. SUU is located in Cedar City, a town of 31,000 people situated amidst isolated rural communities, Native American Reservation land, and National and State Park land. Many families in rural Utah counties and on Native American Reservations live well below the national poverty level. According to the 2010 U.S. Census Bureau, in Iron County School District, the school district that feeds the greatest number of students to SUU, 20% of school-age children come from families in poverty. The 2010-2011 Low Income Report states that 46.62% of students in Iron County received free or reduced lunch. SUU’s Office of Financial Aid and Scholarships reports that, in fall of 2010, 31% of SUU students were first-generation college attendees, 52% qualified as low income students, and 20% qualified as both first-generation and low income students.

SUU has identified first-generation college students, minority students, and students who come from low-income families as those who would especially benefit from several lines of institutional support. The S-STEM Scholarship Program, currently funded from 2012 to 2017 by the National Science Foundation, was created to help meet this need. The academic mission of SUU is “to provide a personalized, integrative, and experiential learning environment designed to prepare students to become fully engaged and productive members of society.” The science, engineering, and mathematics disciplines play an important role in this mission, and SUU hosts several programs and activities to publicize the importance of these fields. The objective of the ongoing S-STEM program is to support academically talented students in these fields who are also first-generation college students, minority students, and/or students who come from low-income families. Support comes in many forms, including: financial support to foster academic focus instead of menial employment; faculty mentorship to foster integrated and deep learning; peer mentorship to foster retention throughout students’ degree programs; and career services to foster students’ transition from SUU to employment or graduate school in their field.

This report provides results from the first 3 years of the S-STEM program. It includes a detailed rationale and description of the scholarship program, basic statistics of the affected students, and highlights from external reviews of the program.

Program Rationale and Description

The estimated Cost of Attendance at SUU for full-time, in-state undergraduate students in 2011-2012 was approximately \$19,098 per year, which included tuition, fees, books, transportation, and living expenses. Expenses are detailed in Table 1.

Estimated Expenses for 2011-2012	
Tuition and Fees	\$ 5,198
Books and Supplies	\$ 1,600
Room and Board	\$ 7,500
Transportation	\$ 2,400
Miscellaneous	\$ 2,400
Total yearly cost	\$ 19,098

Table 1. Estimated Expenses for 2011-2012

In the fall of 2010, 66% of degree-seeking, undergraduate students were determined to have a financial need. The average financial package was \$7,659 for full-time students and \$5,144 for part-time students, which, when compared to Table 1, fell significantly short of the overall costs of attendance. Furthermore, in April 2011, the S-STEM project team surveyed all science, engineering, and mathematics majors at SUU. Of the 299 students that responded to the survey, 58% were receiving no financial assistance from their families, 50% were accumulating debt each year they attended college and 35% of students had at least one other person who depended on them financially. In addition, 59% of respondents claimed that the number of hours employed in a job unrelated to their field of study had a negative impact on their academic performance, and 50% claimed that their employment hours negatively impacted their ability to graduate in four years, while 40% of those surveyed were first-generation college attendees. A high percentage of SUU students will not graduate from college because of financial reasons despite academic ability. Along with academic pressures, many students experience financial pressures that force them to work full-time and/or accumulate significant debt in order to support themselves and/or their families.

This project will increase the likelihood that these students stay at the university, make progress toward their degree, and pursue a graduate degree or secure employment in a relevant industry. These students will be made aware of the possible education and career avenues they can pursue and will be better prepared to achieve success in their pursuits.

Responding to these needs, the S-STEM program currently provides financial support of \$5000 per year to 20 high achieving, at-risk students majoring in science, engineering, and mathematics disciplines. Additionally, the cohort of 20 scholarship recipients register for a one-credit university course each semester involving cross-disciplinary dialogue, discipline-specific seminars, and career-related workshops. Topics such as training in responsible conduct of research, mentoring and tutoring, GRE completion training, résumé writing, and mock interviews have been especially successful. The one-credit course also serves as a touchstone for students to engage in an academic community, which the Association of American Colleges & Universities (AAC&U) includes as one of their High Impact Learning Practices. Because many of the students are first-generation college students, they do not have the financial, social, or emotional support to pursue their educations. The S-STEM program gives students not only monetary support, but social support through participation in the cohort.

The S-STEM program also focuses on fostering undergraduate research in the STEM fields (also an AAC&U High Impact Learning Practice). Student scholars are expected to participate in undergraduate research and are provided funding to share their research in these forums. Faculty mentors guide the student scholars' work, and upperclassmen serve as peer mentors for newer students through formal tutoring, seminar presentations, and informal guidance.

The S-STEM program's goals are:

1. The program will recruit 20 quality students from regional high schools, community colleges, transfer students, or current SUU students who have considerable financial need. The program will focus on first-generation college students and students from rural areas.

Objective: 100% of the scholarships will go to academically talented students who have a demonstrable financial need.

2. The program will increase the enrollment of first-generation college students, minorities, and those who come from low-income families.

Objective: 75% of the scholarships will go to first-generation college students, minorities, and those who come from low-income families.

3. The program will support 20 students while they attend SUU through graduation in a STEM field. The university currently had a 43.5% six-year graduation rate in 2011 and a goal to raise this to 50%.

Objective: There will be a 70% six-year graduation rate among S-STEM program scholarship recipients.

4. The program will improve retention rates among STEM students. In 2011 the university had a year-to-year 63% retention rate with a goal of 70%.

Objective: There will be a year-to-year 80% retention rate among S-STEM program scholarship recipients.

5. The program will offer S-STEM scholarship recipients an enhanced educational experience through their participation in a community-building cohort.

Objective: 100% of the scholars will be involved in the learning community and will be required to participate in cohort-related activities. Students will participate in at least three of these activities per semester, including at least one scholarly seminar and at least one career-related seminar. The project team will review each S-STEM scholar's academic progress and involvement each semester, in order to identify scholars in jeopardy of losing their award. The project team will proactively intervene and arrange necessary help for students to keep their awards whenever possible.

6. Junior and senior students in the program will act as mentors to sophomores and freshmen.

Objective: 100% of students will be engaged in some form of mentoring. They will be expected to take part in cooperative education communities through advising, tutoring, conducting seminars, or working as Teaching Assistants (for university credit or for pay through other university funds).

7. The program will provide post-graduation preparation. There will be career training as well as opportunities to learn about graduate work and internships.

Objective: Scholars will have the opportunity to attend career-related workshops such as seminars about professions in the STEM disciplines, resume writing workshops, or mock

interviews. Those that wish to further their education will be provided information and training for GRE completion.

8. The program will place talented students in either graduate schools or industry careers.

Objective: At least 70% of scholars will be accepted into a graduate program or will have been offered an industry job within one year of degree completion.

The S-STEM program advances discovery and understanding by promoting teaching, training, and learning through programs that involve students in research, career placement, mentoring, and conference participation. The benefits to society realized by the S-STEM program will augment the STEM work force and scientific skill in rural and isolated areas of southern Utah. The S-STEM program will act as a model for other STEM programs that seek to enhance recruitment, retention, and graduation rates and to acquaint their students with research and career opportunities available to STEM graduates.

Three-Year Results

The Woodside Research Consortium (WRC) has served as the external evaluator for the S-STEM program since its beginning in 2012. Based on their review, the S-STEM program has made the following progress toward the eight stated goals, as of the 2014-2015 school year.

Progress toward Goal 1: Four senior class program participants graduated in May 2014, and one in December 2014. One junior class student switched out of a STEM major. Seven new students were recruited again this year to bring the cohort to full capacity at 20. Of the current 20, four students are freshmen, four are sophomores, one is a junior, and eleven are seniors.

Progress toward Goal 2: In the third year, 86% of the 20 scholarships were awarded to students who are first generation college students, minority, or low income.

Progress toward Goal 3: Over three years, the S-STEM program has seen all but three of its participants continue on the intended path in a STEM major toward and beyond graduation. Two students dropped out of the program due to academic challenges, and another switched majors out of the STEM field.

Progress toward Goal 4: The support infrastructure put into place by the S-STEM program includes seminars, workshops, and mentoring to stimulate students' interest in their discipline, encourage them to make informed academic choices, and strengthen retention. The following graph of Survey Question #10 shows that the majority of students believe the seminars, workshops, and faculty mentoring have encouraged their interest in their discipline by "explaining opportunities in the field" (80% or 16 students); by "exposing [them] to aspects of the discipline of which [they were] unaware" (75% or 15 students); and by "reinforcing the link between academics and working life" (55% or 11 students). These responses are a favorable indication of high retention rates.

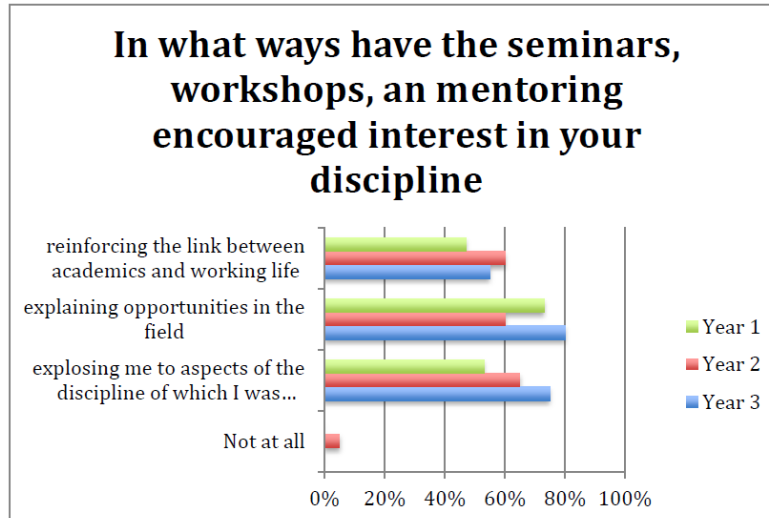


Figure 1. Graph showing survey results from WRC’s external assessment. Q10. In what ways have the seminars, workshops, and mentoring encouraged your interest in your discipline? (Check all that apply.)

Furthermore, one student described how exposure to various dimensions of her field is helping her to determine her primary interest: “I am still in the deciding phase of what specifically I want to do with my major, so constantly learning about new options is fantastic.” Scholarship monies have enabled a greater number of students during 2014-2015 (13 or 65%; up from 9 during the previous year) to forego all outside employment, and another six (30%) to work fewer hours (Survey Question #12). Seventeen out of 20 students (85%) reported that working less increased their academic productivity “a great deal,” while two students reported that less time spent at work increased their productivity “a little,” and one student claimed he did not work less than before (Survey Question #13). Every effort continues to be made by faculty mentors to provide employment within STEM departments for those who must work.

In the program’s third year, all but one of the initial groups was retained, as one student switched to a non-STEM major. When asked, “What issues, if any, still hinder your progress?” Students continued to cite “financial need” (44% or 8) and “family demands” (48% or 8) as their most pressing issues, as in the first two years of the program. A smaller number (2 or 12%) than last year cite “non-academic work demands,” and two senior students (12%) indicated “inadequate counseling” (Survey Question #14).

Progress toward Goal 5: A graduating senior remarked. “Jana Lunt [S-STEM Program Director] was incredible at getting out information to us. I really appreciate all of the faculty support and financial support and the opportunity to give back.” Additionally, each student is assigned a SUU faculty mentor and primary research advisor from a pool of at least six professors in the relevant disciplines and may switch to another if the match is not compatible. When asked to what extent their faculty mentor is useful in giving information about their discipline (Survey Question #7 below), the percentage of students who rated their faculty mentor as “extremely useful” or “very useful” rose from 60% (12) in the first two years to 70% (14) in 2015. A sophomore commented, “The S-STEM program here at SUU is phenomenal. All of the faculty mentors are more than happy to help with anything!”

The S-STEM program focuses resources on the cohort in additional ways, through required participation in four seminars and by bringing industry speakers to campus monthly. During the 2014-2015 school year, an emphasis was placed on engaging students in undergraduate research opportunities and on facilitating student participation in regional, national, and international research conferences held on and off campus. Faculty mentors facilitated students' awareness of, and access to, an array of opportunities. At least six events were held on campus, including Engineering Night. S-STEM students participated in, and presented at, SUU's Festival of Excellence in April, highlighting noteworthy student research. Biology majors attended and presented at the Society for Freshwater Science international conference in Milwaukee, Wisconsin, and at the April 2015 conference of the National Council on Undergraduate Research at Eastern Washington University.

All participants indicated that the scholarly seminars they attended are useful in giving information about one's discipline (Survey Question #5), with 90% (18) declaring the seminars to be "moderately useful," "very useful," or "extremely useful." This level of response matches the previous year's ratings. When asked to what extent the scholarly seminar provided help with coursework, students responded more positively than in previous years. Forty percent (8) indicated the scholarly seminar aided coursework "a great deal" or "a lot," compared to only 30% (6) in 2014. Fifty five percent (11) of students indicated the seminar helped "a moderate amount" or "a little," and (as during the 2013-2014 school year) only one student felt it did not help him/her at all with coursework. Those for whom the seminars were less relevant to helping with coursework may have attended sessions designed for other purposes, such as to widen exposure to the field or to introduce students to topics not closely related to current coursework.

Sixteen out of 20 students (80%) rated the S-STEM program as being "very supportive" or "somewhat supportive" when difficulties were encountered. One student (5%) rated the program as "minimally supportive," and three stated that they "have not had major difficulties requiring support." These responses reflect a slight drop from the previous year, but they are more favorable than those of the same question in Year One, when only 60% of participants rated the program as "very supportive." The preponderance of seniors this year may be reflected in the larger number of students who report they've not had major difficulties (as seniors they've already overcome obstacles along the way). As each year builds upon the last, students benefit from solutions devised in earlier stages of the program. In successive years it is increasingly likely that the S-STEM experience will be recognized by participants as distinct and cohesive, as it becomes shared by an ever-larger group of students who have common goals and face similar challenges. As the program continues, more students will share a history, mechanisms for support will be added, and pathways to success will be more evident.

Progress toward Goal 6: The built-in peer-mentoring component continues to encourage more experienced students to help less experienced students or those with more advanced knowledge in a subject area to assist those with less. While this facet of the program has much potential, students and faculty alike recognize it is a challenge to meet everyone's needs, partially due to the small number of student participants and the fullness of each student's schedule. There is a built-in tendency for students to prefer to meet with others who share their major and can assist in their mutually required coursework. This runs counter to the faculty's desire to have students exposed to peers across the science disciplines, in the interest of cross fertilization, expanding

awareness and discovery of a variety of aspects to any given field. During the 2014-2015 school year the frequency and grouping was modified. Rather than mixing students from different majors, the peer mentoring groups were formed within disciplines. Students reportedly preferred this arrangement. To compensate, they met socially once per month as an entire heterogeneous group, instead of only twice a semester. It was not compulsory, but the free food drew all but five or six, who seldom came. When asked about the helpful effect of peer mentoring, more students in the 2014-2015 school year replied that it helped their coursework “a great deal” or “a lot” (35% or 7), than in the previous two years (compared to 25% in year 2, and 33% in Year 1). There is more evidence of students helping one another as the cohort gains a more established identity over time. For example, two students collaborated on poster sessions, and several travelled to conferences and/or prepared symposium presentations together. A senior participant commented on peer mentoring: “I liked meeting with other peers in my discipline. I felt I could really be a lot more help and I knew some of the pitfalls to avoid. I enjoyed doing it this year.” One freshman remarked, “The peer mentoring was probably the best thing about this program!”

Progress toward Goal 7: As in previous years, the two 2014-2015 S-STEM seminars were designed around skills students will need as they pursue their academic and professional careers: resume writing and interviewing. In Year 1 the seminars were “Getting into Graduate School” and “Finding an Internship.” In Year 2 the seminars were “How to do Undergraduate Research” and again “Finding an Internship.” To measure the impact of each seminar, students were asked to rate their understanding of the processes of resume writing and of interviewing before and after experiencing the S-STEM seminar designed around those topics. The following graph reveals a statistically significant perception of positive change in the students’ understanding of creating a resume.

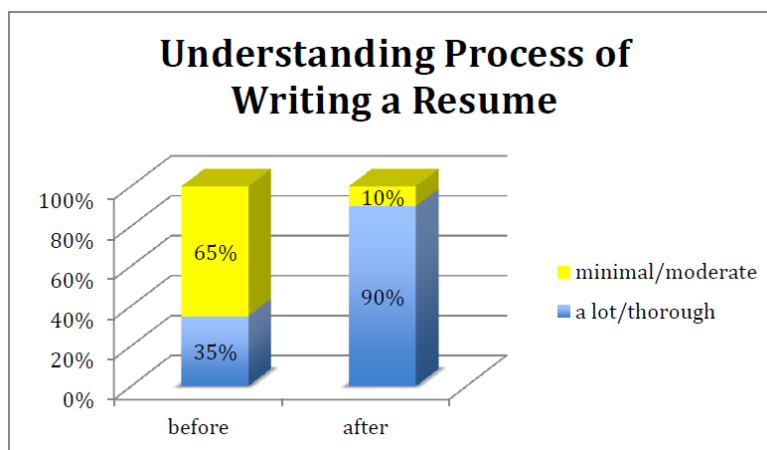


Figure 2. Graph showing responses to WRC survey regarding students’ rating of own understanding of “the process of writing a resume” before seminar participation and after seminar participation.

A similarly significant gain is seen in students’ responses to the pre-post query of how much their understanding improved after participating in the seminar designed to enhance interviewing skills. A dramatic rise in students’ rating of their understanding of the process after being exposed to the seminar on the same topic is illustrated in the following graph.

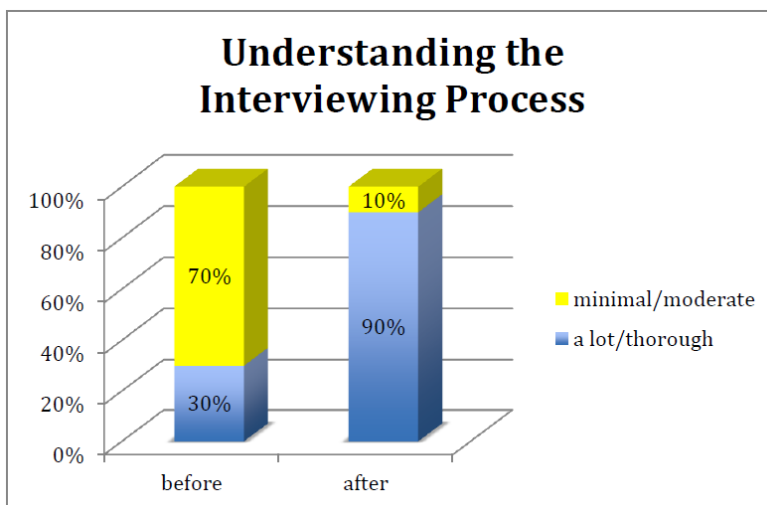


Figure 3. Graph showing responses to WRC survey regarding students' rating of own understanding of "the process of interviewing" before seminar participation and after seminar participation.

Additionally, students responded positively to the S-STEM program's focus on creating undergraduate research opportunities to engage students in work typical of their intended professional field. As depicted below, 65% (13) of students agreed that the program provided helpful research experiences "a great deal" or "a lot."

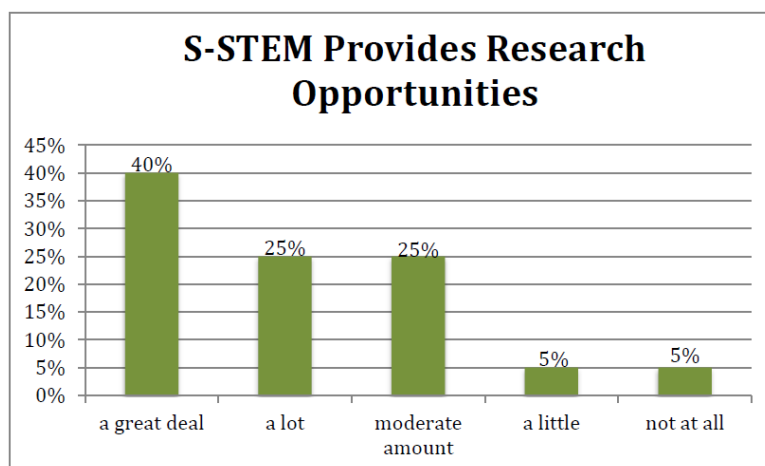


Figure 4. Graph showing responses to WRC survey question asking to what extent the S-STEM program provided helpful opportunities to participate in undergraduate research.

Progress toward Goal 8: While it is too early in the life of the program to determine long-term success in regard to this goal, the statistics for the 2014-2015 seniors were very favorable. Of the twelve graduating seniors, two were employed in STEM, three were seeking employment in STEM as of May 2015, one is continuing in STEM at SUU, and six are pursuing advanced degrees (3 PhDs in Chemistry, Biological Science, Cardiovascular Research; and 3 Masters degrees in Science Education, Geology, Mathematics) at the following institutions: Stanford University, Western Governors University, University of Alabama, University of Missouri, Penn State University, and Brigham Young University. All four graduating seniors from the previous

school year continued either in graduate school (in STEM fields) or in STEM industry careers. The program is fully in line to achieve this goal.

Continued Efforts

As of the end of the third year, the S-STEM program continues to move steadily toward reaching each of the stated goals concerning recruitment, continuous support, community-building, retention, and preparing professionals and scholars for industry and academia. Students are consulted on a regular basis, not only by the annual evaluation survey, but also in periodic meetings, as to how their program experience is evolving and what issues may need attention. Due to the small size of program, the program director, advisors, mentors, and students are relatively familiar with each other. With the alleviation of full financial burden, students are meeting program expectations in terms of academic standards, attendance, and participation. After participating in both required seminars (on resume writing and interviewing skills) the majority of students report a marked increase in their understanding of each process.

The recent emphasis on facilitating undergraduate research opportunities and access to conferences and symposia continues to enhance the S-STEM students' experience and familiarity with real-world applications of their academic subjects. The faculty's efforts to encourage students to think more broadly about the relationships among the sciences and the myriad career avenues potentially open to them has been fruitful, as evidenced in students' comments.

During the 2015-2016 and subsequent school years, in order to address any inadequacies in counseling, an added emphasis will be placed on faculty mentoring. The S-STEM program will enhance the ways in which students and their advisors interact to meet student needs at the earliest juncture. Faculty will explore the differences between "mentoring" and acting as a "role model," as well as ways to alleviate the problems students identify as continually debilitating (financial, family demands, transportation). Lessons learned from the S-STEM program's first three years will be employed to students' benefit in the fourth year. Refinement of the most effective peer-mentoring model and of ways to facilitate student access to undergraduate research will continue.

Conclusions

Since its inception in 2012, the S-STEM program at SUU continues to provide a series of interconnected opportunities to students majoring in science, engineering, and mathematics fields who have been identified as first-generation college students, minority students, and students who come from low-income families. Opportunities include financial support, faculty and peer mentoring programs, and professional and graduate school preparation seminars. Based on external survey results, students recognize the value of the program, and the goals of the program are being successfully met. Continued adjustments based on lessons learned will improve the students' experiences. This program can serve as a model for supporting students with financial and/or social disadvantages.

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