

Lessons Learned from a NSF S-STEM Project in a Rural and Hispanic Serving Institution

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Abstract

For the last four years, the College of Engineering and Technology at Northern New Mexico College (NNMC) has implemented a NSF S-STEM Project named Pathways for Engineering: Access to Resources for Learning (PEARL). The program has benefited more than 50 different students with more than 150 scholarship awards assigned in this period.

The institution is in a highly underserved rural community with 77% of the students receiving Pell Grants or some other type of financial aid. In addition, 60% of the students are first generation college students (when dual credit students are excluded). The student body demographics are 72% Hispanic, 9% Native American, 9% White, 2% African American, and 8% other.

The objectives of the project include: 1) to enhance educational opportunities for under-represented minorities by focusing on the recruitment of full-time students from the region into one of two existing Engineering Baccalaureate programs offered at our institution; 2) to provide sufficient financial resources to enable students to focus on their education, complete their degrees, and prepare for a career and/or graduate studies; 3) to increase the retention rate and monitor each supported student's progress to ensure their completion of degree requirements within a reasonable time frame; 4) to encourage students to graduate and continue their education in graduate school, or obtain employment in local industry, such as a nearby national laboratory; and 5) to engage scholarship recipients in college activities and encourage college service career options, such as teaching and research.

The indicators measuring the effectiveness of the project are: 1) increasing the degree progress rate; this means that scholarship recipients will successfully complete a minimum of 12 credit hours towards the degree per semester; 2) increasing the overall GPA of student recipients; the target will be a 3.5 average for the cohort; 3) increasing the number of students involved in undergraduate research projects within the College of Engineering and Technology; and 4) increasing job opportunities for scholarship recipients.

This paper describes partial results and lessons learned from this project. It also discusses some results in terms of goals and performance indicators, particularly, the high retention rate of the participants in comparison to students with comparable academic performance. Emphasis is given on ideas that could assist other similar projects.

Introduction

This paper describes some of the current results and lessons learned from an NSF S-STEM grant project internally named PEARL, which was awarded to the College of Engineering and Technology at our institution in fall 2013.

The institution at large serves a community with a population of 10,495 inhabitants with a medium household income (2005-2009) of \$34,186 USD. According to the 2010 US Census Bureau, 27.2% of the population and 16.5% of families were below the poverty line [1].

In spring 2017, the overall graduation rate reported was only 22%. The current 6-year graduation rates for the main three urban universities in the state are 45%, 49%, and 42%, respectively, and the three comprehensive regional universities graduation rates are 32%, 22% and 22% [2]. The most recent placement indicators show that 76% of the “First-Time Any College” student population is placed in developmental courses. The main student feeder high-school’s ranking is 3/10 according to Great Schools, Inc. [3].

The institution does not have residence halls, and currently, there are no student housing infrastructures in town which makes the institution a commuter campus with students commuting as far as 90 miles.

The College of Engineering and Technology has about 110 students, with about 90 students pursuing a bachelor program degree. Gender distribution of bachelor students is 20% female and 80% male. One of the requirements for the scholarship was to be a declared major of a bachelor program.

Finally, our institution has the lowest tuition in the Southwest United States for a four-year degree granting institution.

Strategies and Implementation

Low tuition allows us to have a flexible scholarship structure with three types of scholarships:

a) Tuition Scholarships: Awards up to \$2500 per semester for any full-time student (12 or more credits).

b) Living Expenses Scholarship: These awards are a fixed rate of \$2500 per semester and are given in the form of two checks. One check of \$1000 at the beginning of the semester and one for \$1500 during week 12 of the semester. Students are not required to report how the money was spent. The rationale for issuing two separate checks is because we wanted to de-incentivize students from dropping college before the middle of the semester. Historically, a small percentage of students drop from the program and disappear just after receiving a financial award, which would render the scholarship a waste of resources. Also, providing two checks assists students in managing their financial resources.

c) Students with the highest financial need may qualify for both scholarships (“hybrid scholarship” up to \$2500 for tuition and fees and \$2500 stipend for living expenses per semester).

The process in assigning scholarships and other activities is provided in the flow chart below (see Figure 1).

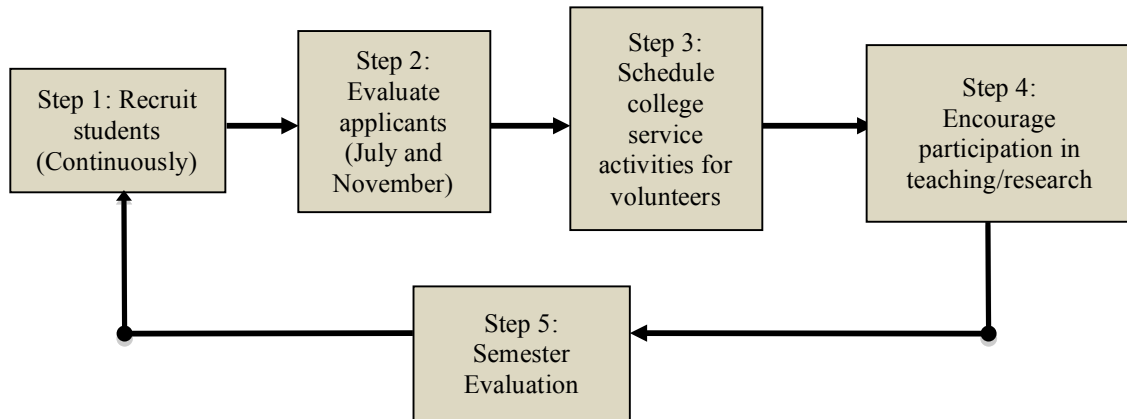


Figure 1: Scholarship Assignment Process

During the first two years of the project, student recipients participated in orientation meetings where college service activities such as peer tutoring and recruitment activities were promoted. These meetings gave faculty time to present their undergraduate research projects and look for student participants or volunteers. In spring 2016, scholarship recipients participated in monthly “Brown Bag Lunch” gatherings with faculty. This activity has continued for the rest of the grant. The informal gatherings were implemented to enhance social interactions between faculty and students, as our student population, in general, avoids office hours and personal interactions with faculty. In general, social interaction between faculty and students is an area of weakness across campus in all programs. Reasons for lack of interaction may be cultural differences, students’ busy schedule as a result of work and/or single-parenting, or even long commuting time from the nearby towns. Additionally, most engineering students are first generation college students. Therefore, these gatherings were implemented as a strategy to enhance the connection between faculty and students. They were the result of observing one faculty member having lunch at the student lounge accompanying with other students. The setup of the gathering is very informal, and all participants are encouraged to bring their own lunch. Informal discussions allow faculty to discuss their personal experiences, including failures and successes. This allows students to ask personal questions and faculty to share their personal experiences. Some employers from the region have been invited and have participated in this activity as well. So far, the range of topics has been broad and have included: how to track expenses using mobile phone applications; how to prepare for the GRE; how to apply to graduate school; how to apply for a job with the main employer in the region; professional etiquette among many others.

Effectiveness Indicators

Currently, data has been collected for seven semesters. The following measures are related to the effectiveness indicators of the project:

1) The number of credits recipients enrolled in each semester were monitored and compared to the number of credits taken the previous term (before the scholarship was assigned). Two different calculations were done. The first calculation is the number of credits in one term after receiving the scholarship in comparison with the number of credits at the term before they received the scholarship (for first time recipients). The terms covered were Spring 2014, Fall 2014, Spring 2015, Fall 2015, Spring 2016, Fall 2016, and Spring 2017. The calculation showed an average of 12.8 credits taken the semester before receiving the scholarship compared to an average of 14.1 credits during the semester the scholarship was awarded. The difference was +1.3 credits with a standard deviation of 3.1.

The second calculation was the average number of credits taken by continuing students in a single semester. We studied students that received a scholarship for more than one semester and compared it to the average number of credits that students was enrolled in from the previous semester, a semester where they were already scholarship recipients. The students who received the scholarship for more than one year were counted for each semester they had a scholarship. Note some students only retained the scholarship for one year, and could not continue due to poor academic performance, graduation, drop out from college, and other reasons.

The average number of credits taken by continuing students in a single semester was 14.4 credits with no change from the previous semester, demonstrating that continuing students did not add more credits. The standard deviation for this count was 3.1.

Finally, the average number of credits taken during all semesters including all student recipients was 14.3, which is an improvement on the minimum of 12 credits required to be eligible for this scholarship.

2) GPA was evaluated for all the recipients that were active (i.e., receiving the scholarship) at the end of term and compared with the GPA of the previous semester. Two different calculations were performed. The first calculation is the GPA for one term after receiving the scholarship versus the GPA of the term before they received the scholarship (only first time recipients were considered). The terms covered were Spring 2014, Fall 2014, Spring 2015, Fall 2015, Spring 2016, Fall 2016, and Spring 2017. The results show an average GPA of 3.2 per semester before students received the scholarship compared to a GPA of 3.2 during the semester the scholarship was awarded. There was no difference in GPA. The GPA scale at the institution is from 0 to 4.33.

The correlation for the differences in GPA per new recipient students and the difference in the number of credits per new recipient students is +0.1. This is a weak correlation between the two variables.

The second calculation was the GPA of any single semester for continuing students who had received the scholarship for more than one semester compared with the GPA of the previous semester. The students who received the scholarship for more than one year were counted for each semester they had a scholarship. The results showed an average GPA of 3.3 during any single semester where they had already been recipients for more than one semester. In comparison, the average GPA was 3.4 during their previous semester. The difference is -0.1 in GPA with a standard deviation of +0.6.

The correlation between the GPA differences per continuing student and the difference in the number of credits per continuing student is +0.3, demonstrating a weak correlation between the two variables.

Finally, when the average student GPA was evaluated for all semesters and all student recipients, the calculation is 3.3. The desirable targeted GPA in the grant proposal was to achieve an average GPA of 3.5 for the recipients.

Up to this point, we evaluated the GPA of students after the scholarship was provided, and the data shows the scholarship is not helping to improve GPA but does help to increase the number of credits taken. As the evaluation continues toward the final year of the grant, no relevant changes are expected from this observation.

3) Regarding the involvement of students in undergraduate research projects, the target was to have 55% recipients involved in a research experience. As of spring 2017, 19 different recipients out of 51 were involved in research. This is 37% of the total number of recipients. From dialogue with students, it has become clear that the scholarship and activities have not been a strong incentive to engage in undergraduate research.

4) Finally, the last measure of effectiveness was to guarantee that before graduation, 90% of the scholarship recipients will participate in a summer internship or get a part-time engineering job. So far, we have 21 different recipients (out of 51), i.e., 41% of the total student recipients have participated in an internship or have a part-time engineering job. When recipient participants are disaggregated, we see that from the students who have already graduated, 10 out of 11 (90.9%) did participate in an internship before they graduated. Consequently, although the indicators remain low, the statistics remain promising since the goal is to reach 90% before graduation. It is very clear the involvement of the main employer in the region, Los Alamos National Lab, together with “Brown Bag Lunch” gatherings motivate students in submitting resumes, cover letters and applying for internships.

Significant Results

The most significant results so far include:

1) Scholarships have been a very successful retention strategy. The institution has a 78% retention from first semester to second semester, but it drops to 66% from the second to the third semester. The six-year graduation rate for the college is 19%. However, as of

Fall 17, of the 57 recipients awarded scholarships over seven semesters, only six recipients have dropped from the engineering program. This is only a 10.5% dropout rate even after several semesters compared to the 34% semester-to-semester dropout rate for non-recipients. Data also shows that three students have transferred to other institutions, but they are continuing the same engineering program. Three students had been suspended from the scholarship program due to poor academic performance, but they have continued to pursue their engineering degree at our institution.

2) As of Fall 2017, of all the scholarship recipients, 14 students have graduated with a bachelor's degree within the last three years. All were employed before they graduated. All but one recipient is working in the same technical field of study; one joined the teacher education program but continues to look for a job in the IT field. Three graduates have also started graduate school in the same technical field of study in their bachelor program.

Lessons Learned Beyond Indicators

There are a couple of strategies and “nudges” that have been implemented during these years to address some concerns that affected the project. First, the project leaders had difficulty during the first semester in reporting some of the demographic information that NSF requires in the semester data reporting system. During the scholarship application process, around 50% of the applicants failed to complete the demographic information sheet because the form used began with a statement, which is typical in such forms, saying that “this information sheet is optional” for the applicants. Therefore, around half of the students defaulted and did not answer the section. From research published in recent literature in behavioral economics [4], it was decided to move the optional statement from the top of the sheet to the bottom. The results were dramatic, and more than 95% of the students providing demographic information during the second semester. This “nudge” continued, and student demographic information has not been an issue anymore.

Secondly, project leaders were surprised during the first years to find that very few students filled out a scholarship application. For example, the first semester there were only nine applicants (from a pool of approximately 60 eligible students). This was unexpected because as it was mentioned before, the institution is located in a region with high poverty and more than 70% of our students struggle financially, with many of them being single parents. Almost each eligible student was informed of this opportunity through their academic advisors and through class visits by the project leaders. The scholarship application was simple and comprised of a one-page document with seven questions and contact information. No personal essay or letters of recommendation were required. By talking to students, it was found that several students believed that it was not worth it to apply because they “felt they would not receive it”. This is a common symptom with students that are first generation college students.

To address this problem, another marketing nudge was introduced in the communication with students: scarcity. The new email communicated to students emphasized the fact that it was very important to apply as soon as possible because “there were too many

applicants for the number of scholarships available”. This same message was communicated during class visitations, student orientations, and engineering faculty. Starting the third year of the project, the lack of applications was no longer a problem. There were even semesters where more than 80% of the engineering baccalaureate students were either a recipient or an applicant.

Conclusions

This paper has presented four years of results from a S-STEM project in a Hispanic Serving Institution. The grant has served baccalaureate students at the College of Engineering and Technology at NNMC.

Current results show that the scholarships have not contributed to improve the average GPA of the recipients, but has helped students focus on their studies and increased their credits per semester. Similarly, this project has shown that the scholarships have not provided enough incentive to students to volunteer for undergraduate research activities at the expected level when the grant proposal was submitted, but has increased the overall number of engineering students involved on research projects at our institution.

The project has also shown that scholarship recipients are retained at a higher rate than non-scholarship recipients, and the students are making substantial progress towards graduation. It is important to know that retention at our institution is highly independent of GPA. Therefore, this project shows that S-STEM grants in communities similar to ours make an enormous difference in the decision to drop or persist.

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