

PEEPS: Cultivating a Cohort of Supportive Engineering Students and Building a Support Team for Institutional Change

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PEEPS: Cultivating a cohort of supportive engineering students and building a support team for institutional change

Abstract

A National Science Foundation (NSF) S-STEM (Scholarships in Science, Technology, Engineering, and Mathematics Program) scholarship program entitled, “**PEEPS**” - **Program for Engineering Excellence for Partner Schools** is a holistic, institutional approach towards recruiting, retaining, and graduating engineering students from disadvantaged backgrounds at the California Polytechnic (Cal Poly) State University. The Partner Schools are those that have been identified to have large percentages of students who qualify for the National School Lunch Program. Data suggests that these students are not only more likely to have low socioeconomic status, but also be first generation college students and/or underrepresented minorities (URM). Adopting a cohort or “posse” model, the PEEPS cohorts form learning-communities to support one another and create a sense of belonging at our university.

The PEEPS program is designed to remove obstacles and to integrate several proven student success strategies in order to help PEEPS students develop and achieve their personal academic and professional goals. Partnerships with Admissions, Financial Aid, and the Multicultural Engineering Program have been developed expressly for this project. The PEEPS program components not only include financial support, but also include several interventions and social activities. These components are designed to help strengthen student identities as an engineer and to increase self-efficacy.

Data reveals that the PEEPS scholarship program has been an effective recruiting tool. By targeting the Partner Schools and First Generation engineering students, the scholarship program is aiding and supporting more diverse students with high financial need. Retention analysis is ongoing through periodic check-ins, interviews and focus groups. Many of the PEEPS components are also being developed to reach a greater number of students beyond the scholarship recipients, such as the Engineering Student Success course and cohort scheduling of gateway engineering courses.

Assessment by interviews and a focus group of the PEEPS has revealed that the cohort scheduling of courses together has helped the students form a community and has assisted with studying for courses. In addition, periodic reflections that aid in student development, as well as ample academic and personal support, are part of the program. Some preliminary quantitative comparisons are made between the PEEPS and other students in the Engineering Student Success course, but the numbers of students and time elapsed are small.

Introduction

The NSF S-STEM Program for Engineering Excellence for Partner Schools (PEEPS) is inspired by the Posse Foundation¹ which identifies public high school students with extraordinary academic and leadership potential who may be overlooked by traditional college selection processes. The Posse Foundation offers these students 4-year, full-tuition scholarships and places them in supportive, multicultural teams – “Posses” – with the goal of promoting simultaneous

personal and academic excellence. Through the formation of posses and similar cohort programs, universities have been able to successfully aid underrepresented students with their adjustment into the academic and social culture of the university.² The NSF S-STEM program at Robert Morris University is one such academic center where the implementation of a cohort model successfully helped student self-efficacy and academic progress.³ While the PEEPS at Cal Poly does not employ alternative admissions models to admit or identify cohort members, our term and acronym, “PEEPS,” captures the idea of a “posse,” “family” or “my peoples” as a group that supports and cares for one another.

Our primary goal is to recruit, retain, and graduate academically talented, financially needy students⁴ from disadvantaged backgrounds to enter the STEM workforce. Through PEEPS, we intend to increase our institutional capacity by identifying effective tools and creating the infrastructure to improve the educational opportunities for disadvantaged students (i.e., low socio-economic status, first generation, underrepresented minorities) effectively and efficiently.

Collectively creating a new scholarship program for underserved students

The conception for PEEPS originated from a university faculty and staff “Diversity in STEM” learning-community through our Center for Teaching, Learning, and Technology. We met regularly for two quarters and in part, we brainstormed ideas for recruiting and supporting diverse students who were anecdotally choosing to go to other universities (both before and after enrolling). A subgroup met on a regular basis and brought in other colleagues, namely Admissions, Partners Program, Financial Aid, and the Multicultural Engineering Program, to design PEEPS and submit the NSF S-STEM proposal. With a common purpose, many different units enthusiastically came together and many people appreciated being asked to contribute their unique perspective and ideas. Our diverse team enabled a better picture of how different campus entities played a role within our institution, and how together, we could attempt to build a strong scholarship program to aid and support underserved students from recruitment to graduation.

The aim of PEEPS is to make a significant impact on those who could benefit the most from the scholarship program (i.e., 1st generation, underrepresented groups, low socio-economic status). Our target group became admitted engineering students from our “Partner Schools,” as they most likely qualify as “very needy” in terms of financial aid points determined from Federal financial aid Free Application for Federal Student Aid (FAFSA).

The Cal Poly Partners Program is an already established recruitment program that partners with lower-resourced high schools throughout the state. Initial partnerships were with high schools that were part of the College Preparation Partnership Program introduced by Senator Tom Hayden in 1998, with additional schools added since this time. Partner Schools have comparatively large percentages of students who qualify for the National School Lunch Program (students from families with incomes at or below 130 percent of the poverty level are eligible for free meals), and students from these schools are more likely to not only have low socioeconomic status, but also be first generation college students and/or from groups currently underrepresented in STEM fields. This particular population was identified as one in which the scholarship program could have the largest impact at Cal Poly on the engineering workforce with improved rates of retention and graduation.

PEEPS offers scholarships to a cohort of admitted engineering students from the Partner Schools at the maximum amount (\$10,000/year) for at least four years. The National Postsecondary Student Aid Study: 2009-2010, conducted by the *National Center for Education Statistics (NCES)*, found that low-income students face higher unmet need than other students. As a result, even though the target population may be receiving financial aid, it does not necessarily mean that their financial needs are met. Students whose financial needs are unmet by school aid packages typically will compensate by working part- or full-time, or taking out additional loans. However, working while attending college can have negative impacts. It has been found that while 1 to 15 hours of work per week contributes positively to retention, working more than 15 hours per week tends to result in weaker grades and a lower chance of graduation.⁵ On the other hand, even \$1000 of increased aid is positively correlated with probability of retention and graduation.⁶

Instead of time spent working to help pay for school, students would be able to redirect their time towards studying and participating in co-curricular activities. The sizeable scholarship and continued support through their college career would make a very attractive recruitment tool. Many admitted URMs were choosing not to enroll at Cal Poly because other schools are able to offer large scholarships, and several internal reports have recommended scholarships.⁷

Recruitment

Targeting students who could best benefit from PEEPS

The NSF S-STEM scholarships are intended for academically talented, financially needy students, and PEEPS has been designed to be offered to students who have already been accepted into engineering programs at Cal Poly. Data from previous school years indicated that we would have a sufficient pool of students from our set of criteria that would qualify for the scholarship program. The percentage of these students needing high financial aid is significantly greater than low financial need, and thus substantiates the scholarship award being the maximum \$10,000 per year. In addition, the group of students at Cal Poly with the lowest persistence rates is those with Pell grants (vs. 1st generation and URM), most likely due to financial hardships that lead to poor performance or dropping out.

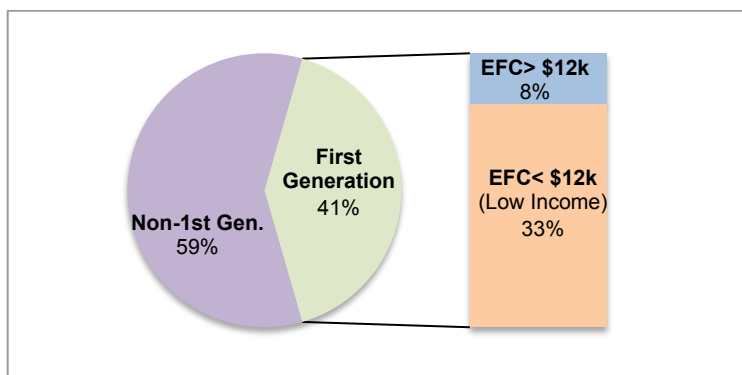


Figure 1. Targeting admitted engineering students from Partner Schools (Fall 2015) reaches a high percentage of First Generation and low-income students.

Among the admitted (i.e., accepted) engineering students for Fall 2015, 572 (out of 3427) students were from Partner Schools, and 41% of them were First Generation (Figure 1), compared to 8% of the non-Partner School students. Furthermore, out of the First Generation

Partner Schools admitted students, 81% of them (or a total of 191) had very high financial need (i.e., estimated family contribution, EFC < \$12k), Figure 1. Thus, the admitted engineering students from Partner School are a population that could greatly benefit from the scholarship program.

The PEEPS scholarship program is also a study in how large scholarships for continued years of support impact student success. Thus for this S-STEM grant, only 2 sets of cohorts are supported, and the criteria for PEEPS is listed in Table 1. The first year of the grant was restricted to Mechanical Engineering (ME) to facilitate a common schedule of courses. In addition, due to the large size of the ME department, we felt that having a cohort could avoid the sense of isolation that can occur. For the following year, we expanded the eligibility to include Civil Engineering (CE) and Environmental Engineering (ENVE), yet narrowed the pool to First Generation students and those with EFC of less than \$12k.

Table 1. Eligibility criteria for PEEPS scholarship program for 2 cohorts

	Cohort 1 (2014)	Cohort 2 (2015)
Criteria	Partner School Financial need Accepted into ME program	Partner School EFC < \$12k Accepted into ME, CE, or ENVE First Generation
# eligible	42	55
# applied	15	18
# PEEPS	6	7

Applying for PEEPS

The PEEPS scholarship program is different from other freshmen scholarships at our university in that there is an application process. We wanted to target students seriously wanting to attend Cal Poly and to ensure that the recipients truly wanted to be part of a cohort learning community. After the criteria and eligible students were determined, a letter was sent out via email and regular mail. The regular mail also included a Spanish version in case parents were native Spanish speakers. Follow-up phone calls were also made to encourage students to apply and to answer any questions. In order to give each applicant the best chance, we also devised an essay review process to be conducted by support team members that were not on the selection committee. This review process with feedback on the application essay before final submission would also be a learning opportunity for the applicants.

The letter explained PEEPS with the following text:

*Modeled after the “Posse” Foundation, PEEPS students will form a **learning community** to support one another and will take several engineering support courses together. Selection is based on the potential and commitment to succeed academically and professionally in engineering (and not on high school grades or test scores). In addition, commitment to contributing to the PEEPS learning community is essential. We anticipate a yearly cohort of about 6 students each.*

Because we'd like to ensure that everyone is able to put their best effort forward, we are offering the chance for your application to get reviewed by members of the PEEPS team that are not on the selection committee. Thus, the "PEEPS review team" will read your application essays and give you direct feedback in order for you to revise your application for final submission.

An aggressive timeline was implemented in order to give ample time for completion of the PEEPS application, review, revision, and resubmission. The time between invitation letters and notification of selection is roughly 3 weeks, and then roughly 2 more weeks follow until the deadline to state the intent to enroll. To have a low barrier to apply, we devised the application to be short, concise, and online. The application questions are listed in Table 2.

Table 2. PEEPS scholarship program online application questions (by invitation only)

Essay prompts for PEEPS application
<p>Tell us about yourself (required) <i>What has led you to this point in your life of being admitted to Cal Poly? Discuss your family background, community involvement, activities, challenges, ... [100-250 words]</i></p>
<p>Tell us about your future aspirations (required) <i>What are your college and career goals? [100-250 words]</i></p>
<p>Tell us why you'd like to be part of PEEPS (required) <i>What do you hope to gain from PEEPS, and how would you contribute to PEEPS? [At least 100 words]</i></p>
<p>Tell us anything else that you'd like to share with us <i>Optional [100-250 words]</i></p>

Recruiting a diverse population through PEEPS

Over the two years of accepting PEEPS students, a total of 97 students were eligible and 33 applied. Not all eligible students applied (~67%), which may be indicative of the student's intention to enroll elsewhere despite the invitation to apply for PEEPS, and Figure 2 reveals that most of those students (88%) did not enroll. For the 8 students who were eligible but did not apply and yet still enrolled at Cal Poly, a follow up email questionnaire revealed that they did not look into the opportunity carefully or did not have the time to apply. For some of the students who did apply but were not selected for PEEPS, they responded that they enrolled at other universities for financial reasons (9 out of 19). And not surprisingly, several of the PEEPS said that they enrolled at Cal Poly (13 out of 14) due to the scholarship program and would not otherwise have been able to attend. While the PEEPS scholarship program has been effective with its yield rate as a recruitment tool, the large scholarship amount for a small number of students may not be sustainable for the university beyond the grant period. Further, the numbers of students in this analysis is small and cannot necessarily be generalized. However, we do feel that the PEEPS scholarship program is an effective recruitment tool.

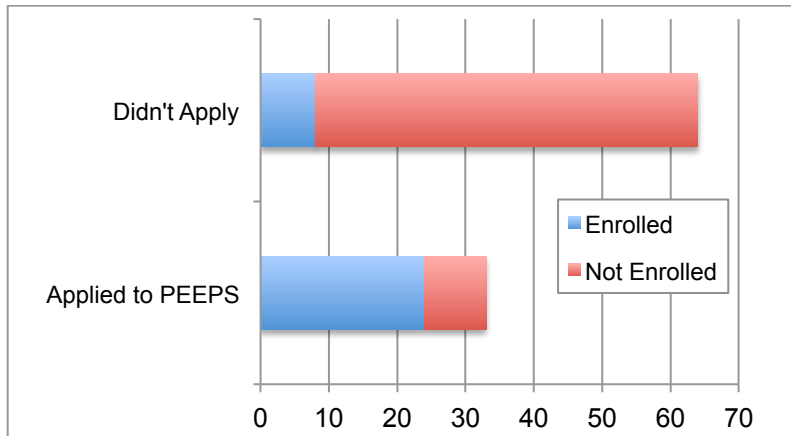


Figure 2. The yield rate for students applying to PEEPS is high, and those who didn't apply had most likely already decided to enroll elsewhere. Some who applied to PEEPS and were not selected cited financial reasons for not enrolling.

Figure 3 shows the demographics of the two cohorts of PEEPS and reveals a high percentage of underrepresented groups. In addition, 31% of the PEEPS are female, 69% are Hispanic, and 85% are First Generation. The application entries were identified by ID numbers only and had no information on the name, gender, or ethnicity. Thus, selection was based only on the essay responses and the selection team deliberated on who could contribute and succeed within PEEPS.

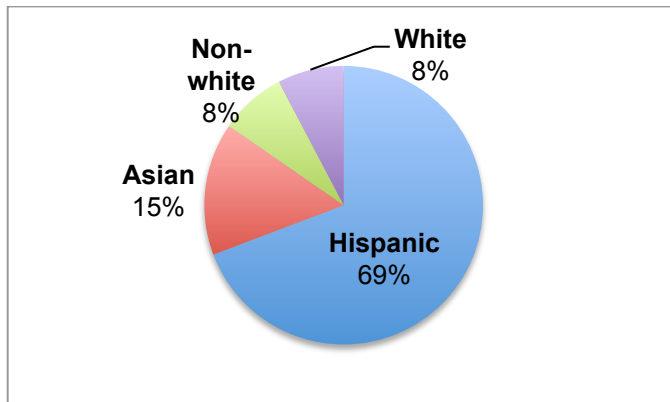


Figure 3. The two cohorts of 13 PEEPS represent a diverse group even though the PEEPS selections were done without any gender or ethnicity identification.

Program Components

Approaching interventions in a holistic manner

A holistic approach was taken to consider the entire student experience from recruitment to graduation at Cal Poly. In addition, a variety of resources already established on campus were bundled and supplemented by PEEPS-specific activities. The program components include:

- summer orientation PEEPS event with families
- shared reading book (*Mindset*⁸ by Carol Dweck)
- block scheduling of gateway engineering support courses with supplemental workshops
- weekly scheduled study room and tutor
- Engineering Success courses
- quarterly advising with PEEPS Coordinator and faculty/college advisor
- individualized coaching and mentoring of personal academic and professional goals
- science/engineering outreach activities to local schools

- peer mentors
- social events

Employing Cohort Scheduling for Student Success and Support

For each of the PEEP cohorts, we arrange for them to take the engineering support courses together in the same sections as much as possible. The engineering gateway courses (i.e., Math, Chemistry, and Physics) tend to be challenging and stressful for students. While many support services are made available to all students, there is often reluctance for students (especially those from disadvantaged backgrounds) to utilize such resources. In addition, some highly successful services, such as the “supplemental workshop” program, can be difficult to get into and fit into student schedules. The workshops are credit/no credit unit courses led by a trained facilitator to do additional problems for a particular class. PEEPS get reserved seats in particular sections of their support courses in order for them to take classes together and be able to study together. Partnerships with different departments across the campus are vital for this aspect, and for the most part, we have had successful collaborations.

Through the grant, we have also developed and implemented an “Engineering Student Success” course (ENGR 270/101) for the first quarter of first year engineering students. The course is advertised to all engineering students, but First Generation students are targeted and all PEEPS are automatically enrolled.⁹ The course highlights academic skills and resources, and provides navigational capacity.¹⁰ Course goals include developing the engineering identity, building resilience and self-efficacy, and creating a sense of community among the students. For many students, a strong support network is essential for success; however, these students often find themselves isolated by their unique experience from their original home communities and their on-campus peers.¹¹ Since universities are often sources of pressure, underrepresented students may feel as if they cannot alleviate academic stress when other stressors are affecting their well-being.¹²

In addition, students who are first-generation college students, economically disadvantaged, and/or from groups currently underrepresented in STEM fields may also have difficulties with their self-perception of their capabilities, or self-efficacy, as a scientist or engineer.^{13,14} Low self-efficacy is considered one of the main reasons underrepresented students do not persist in their STEM major.¹⁴ Often faced with a sense of loneliness and stereotyping within the academic world,^{15,16} underrepresented students’ success in STEM is stymied by a poor self-image as a student or future STEM professional. An academic environment most closely represents the dominant culture, and therefore the middle-class, white male (most prevalent in STEM) has a greater chance of comfort and high self-esteem as a scientist or engineer.¹¹ For underrepresented students, the dominant culture can seem oppressive when there is no support network or enough acknowledgment of diverse backgrounds.¹¹

Assessment

As part of the grant, we are collecting data on the use of strategies linked to success in engineering nationally and at our institution such as utilization of office hours, supplemental workshops, tutoring, student success seminars, advising, health and counseling services, career services, recreation center, etc., and participation in clubs, outreach, research, service learning

opportunities for each PEEPS student. The strategies for retention and persistence that are utilized by the students are collected through the advising meetings with staff and faculty. We hope to determine which activities are especially effective, and will be able to make conclusions only after more time has passed to develop a more complete picture.

For formative assessment, we have employed an outside evaluator to do interviews and conduct a focus group with the PEEPS, and report on the first cohort here. We are also tracking traditional institutional metrics like progress to degree and grade point average (GPA). The quantitative data is interesting, but we are aware that no generalizable conclusions can be drawn from such a small sample. The qualitative data is helping us to build a case study for this contextualized experiment.

Learning from the PEEPS via interviews and focus groups

During the Winter quarter of their freshman year (January 2014), the first cohort of PEEPS students were interviewed individually by a researcher who is part of the University's Center for Teaching, Learning, and Technology. She asked them questions about their transition to college, the resources that they have used, their Mechanical Engineering major, the PEEPS program specifically, and what they have been proud of. The questions can be found in Appendix A.

Four out of the six thought the transition to college was easy. The other 2 referred to a tough start, but were doing fine now. They all said there were challenges. Some found it hard to make friends. Others struggled with classes and time management. One student mentioned the fast pace of the quarter system was difficult to get use to, but overall they all feel that they making a good transition. Below are three of the quotes from students about the transition.

"For me I think it's been a fairly good transition"

"It's definitely been a real big leap."

"It was a little rough. Because, I kind of treated it like senior year of high school. And, it's definitely not like senior year of high school, so I started off a little shaky in some of my classes. But, about now I feel like I have a good grasp on everything, where I need to be, and what I need to do. It's been a learning experience."

When asked about the resources that they utilized, students feel very supported. They find family and friends, roommates, the dorm, workshop leaders, and PEEPS to be great resources. Three of the 6 students specifically mention PEEPS as a source of support.

"Surprisingly I've been supported almost everywhere I go"

"I have great support from my family. They support me all the time."

"I would have to say the PEEPS provide a lot of support. They've really helped me out a lot this quarter. I was 12th rotation and they came through with permission numbers [for registration] and that really helped out a lot."

When asked about the ME major, Students report enjoyment in their engineering classes. They like the hands-on activities and "taking things apart." They also like the people in the

department, students and teachers. One student mentioned having a hard time with the level of work involved.

“It’s been pretty great actually. The classes that I’ve had so far have been really interesting, kept me really busy and interested.”

“I’ve done a lot of hands on stuff, especially in the labs.”

“The labs we have done have been engaging and hands on.”

When asked about PEEPS, the students refer to the extensive support they feel from the faculty and staff and from each other. They enjoy social activities together and they like having classes together.

“Definitely the administrators and faculty. They have the resources that I never had during high school. I can go to them and ask questions and they will give me an answer or put me in touch with someone who does have the answer. So resources are a big deal. They are really friendly and help you adjust. Like family.”

“I think the fact that it’s a cohort, and we can bond, because we share the same classes and things is cool. It’s easy to go to each other and ask for help.”

Three of the six students mentioned “taking apart an engine” in their ME course as something they were proud of. One indicated he was proud when he could help others. Another was proud of how he responded when he did poorly on an exam – he studied twice as hard for the second and was rewarded with a better grade. One student was elected to a position in a club. A couple students mentioned working in a team environment as satisfying.

“We took apart an engine and I’ve had experience working on engines before. One of the other PEEPs was in my group and didn’t have engine experience. So I was helping my group by explaining when I could, which made me feel good. The professor came over and we had a discussion about engines and it made me feel good and that I belonged in engineering.”

“It was probably in my Calculus class because I completely bombed the first test. It was really awful. And for the next test, it was like study, study, study, the whole week before. And I did a lot better on it.”

“Uh... So yesterday I went to a meeting for the Society for Hispanic Professional Engineers and I found out that I got the position of freshman representative. And that’s really good.”

Students were very reflective on what they have learned personally. One said he learned he really did need to study, unlike in high school. Another indicated he learned that it’s ok to be himself. One student referred to the ENGR 270 (Engineering Student Success) course as a source of interesting personal learning. Another student referred to learning how to talk to others about his ideas.

“This quarter I think I’ve learned a lot about myself. Definitely in the 270 course. They helped me reflect on my learning and being an engineer. I enjoy working in groups. I

learn best when I discuss my ideas. And in engineering that's important. It makes me happy to know that I chose something that my learning style is best fitted for. I really like learning about myself and how other people learn."

"Probably, I don't know, I always felt that I just naturally did well. Like, I never needed to study and I learned that I DO really need to study. And that it's not a bad thing to have to study for a test. And, it helps a whole heck of a lot. And, I'm going to have to learn more in the future. And, it's actually ok to fail. I had never had that experience before."

The ENGR 270 (and the next year, ENGR 101) class was taught as part of the NSF S-STEM PEEPS grant, and targeted First Generation and underrepresented engineering freshmen students. A big component of the Engineering Student Success course was the developmental aspect of becoming an engineering college student and several reflections were assigned⁹.

Measuring Institutional Indicators

Students in the PEEPS cohort were compared to other students in the Engineering Student Success Course for the past 2 years. Other comparison groups are to be done in the future to tease out possible trends. Table 3 represents the first attempt at analyzing quantitative measures that are easier to obtain. Data was collected on major change, completion to degree percentage, grade point average (GPA), number of quarters on Academic Probation (AP) and the number of D's or F's. Table 3 has a summary of these values.

Table 3: PEEPS and ENGR 270/101 GPA and progress analysis

Cohort	2014-15 (4 quarters completed)		2015-16 (1 quarter completed)	
	PEEPS cohort 1	ENGR 270 Non-PEEPS	PEEPS cohort 2	ENGR 101 Non-PEEPS
Number in cohort	6	16	7	12
Major entering Cal Poly	ME	All Engr majors	ME, CE, ENVE	All Engr majors
Major Change	2	2 (1 transfer to BUS)	-	-
Percent Complete	35.5%	34.8%	12.5%	13.8%
Approximate Expected percent complete	33.3%		8.3%	
Average GPA	2.83	2.96	2.31	3.14
Number on AP during any quarter	1	3	5	0
Average Number of D/F per person	1	1.2	1	0.2

The first PEEPS cohort seems to be very similar to the comparison group, but the second cohort had poor academic performance during their first quarter at Cal Poly. Five of the seven PEEPS in the 2015 cohort are on Academic Probation at the end of Fall 2015. Of course this is a concern for the team, but the small numbers in this cohort indicate that this might be a random occurrence. All the students are on track for degree completion. What might be more important is that the PEEPS are receiving immediate support to develop resilience, time management and goal setting skills through the PEEPS support team of faculty and staff. How they respond to

their first quarter, the steps they take to improve their academic performance, and their resulting grades for the following quarter will be of great interest.

Summary

The Program for Engineering Excellence for Partner Schools (PEEPS) NSF S-STEM grant has allowed Cal Poly to offer sizeable scholarships for continued years within an integrated program for student success. Two cohorts of students from Partner Schools (i.e., disadvantaged and large under-representative populations) have been enrolled and have formed learning communities. We have been successful in recruiting students to Cal Poly with PEEPS and we are currently assessing the scholarship program components (e.g., persistence and retention strategies) for their effectiveness. Tentatively, we see that cohort scheduling and periodic reflections are beneficial. We are constantly learning from our experiences with PEEPS in order to strategize in how to affect institutional change to support our students.

Acknowledgements

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References

- ¹ www.possefoundation.org/
- ² Sturm, Susan. (2010) Activating Systemic Change Toward Full Participation: The Pivotal Role of Boundary Spanning. *Institutional Intermediaries*, 54 ST. LOUIS U. L.J. 1117
- ³ Kalevitch, M., Maurer, C., Badger, P., Holdan, G., Iannelli, J., Sirinterlikci, A., Semich, G., and Bernauer, J., Building a Community of Scholars: One University's Story of Students Engaged in Learning Science, Mathematics, and Engineering Through a NSF S-STEM Grant, *J. of STEM Education*, Vol. 13, Issue 4, July-Sept. 2012, 34-42.
- ⁴ www.nsf.gov/funding/pgm_summ.jsp?pims_id=5257
- ⁵ *Student Financing of Graduate and First-Professional Education, 1999-2000, NCES, 2000.*
- ⁶ Whalen, D. & Shelley, M. (2010). Academic Success for STEM and Non-STEM Majors, *Journal of STEM Education: Innovations and Research*, Vol 11, No 1., 45-60.
- ⁷ Cal Poly Compilation of Information for Inclusive Excellence, ed. David Conn, (June 2012): includes Black Student Retention Report 2012 by Donna Davis; recommendations for recruitment & retention of 1st gen (April 2007); and Partners Program Focus Group recommendations (May 2010)
- ⁸ Dweck, C. S. (2006). *Mindset: The new psychology of success*. New York: Random House.
- ⁹ Liptow, E., Parent, R., Duerr, J., and Chen, K. (2016). A Sense of Belonging: Creating a community for first-generation and underrepresented minorities through an Engineering student success course, *ASEE Annual Conference Proceedings 2016*.
- ¹⁰ Carrigan, C., Riskin, E., Borgford-Parnell, J., Mody-Pan, P., Wiggin, D., and Cunningham, S. (2015). Learning from Pell-Eligible Engineering Students' Class Standpoint, *ASEE Annual Conference Proceedings 2015*.

- ¹¹ Cole, D., & Espinoza, A. (2008). Examining the academic success of Latino students in science, technology, engineering, and mathematics (STEM) majors. *Journal of College Student Development*, 49(4), 285–300.
- ¹² Pascarella, E. T., Pierson, C. T., Wolniak, G. C., & Terenzini, P. T. (2004). First-generation college students: Additional evidence on college experiences and outcomes. *Journal of Higher Education*, 75(3), 249-284
- ¹³ Soldner, M., Rowan-Kenyon, H., Inkelas, K.K., Garvey, J., & Robbins, C. (2012). Supporting students' intentions to persist in STEM disciplines: The role of living-learning programs among other social-cognitive factors. *The Journal of Higher Education*, 83(3), 311-333.
- ¹⁴ Hurtado, S., Cabrera, N.L., Lin, M.H., Arellano, L., & Espinosa, L. (2009). Diversifying science: Underrepresented student experiences in structured research programs. *Research in Higher Education* 50(2):189-214.
- ¹⁵ Hurtado, S., Eagan, M. K., Tran, M. C., Newman, C. B., Chang, M. J. and Velasco, P. (2011). We Do Science Here?: Underrepresented Students' Interactions with Faculty in Different College Contexts. *Journal of Social Issues*, 67, 553–579.
- ¹⁶ Walters, N. B. (1997). Retaining aspiring scholars: Recruitment and retention of students of color in graduate and professional science degree programs. ASHE Annual Meeting Paper.

Appendix A. Interview Protocol Questions for PEEPS Interviews and Focus Group

How was the transition from high school to Cal Poly?

Who or where have you been able to find support?

Can you tell me about your experience in the Mechanical Engineering program at Cal Poly so far?

Has the major been what you thought it would be?

Can you tell me about a specific experience at Cal Poly where you felt proud of yourself or your work?

What resources do you think contributed to that experience?

What did you learn about yourself through that experience?

Can you tell me about a specific experience at Cal Poly that has been difficult for you?

What resources did you use to persevere through that experience?

What have you learned about yourself through this experience?

Have you been involved with any groups at Cal Poly?

Can you tell me about a specific part of the PEEPs program that is working well? And, why is it working well?

Can you tell me about a specific part of the PEEPs program that could be improved? And, how it might be improved?

Did the PEEPs program affect your decision to enroll at Cal Poly?

Has the PEEPs scholarship program met your expectations?

What could you do to help PEEPs, as an individual?

What does the PEEPs cohort, or learning community mean to you?

Is there anything else that you might like to tell me about the program that the interview made you think about?