

Supporting Low-Income Engineering Transfer Students' Transition from Community College to a 4-Year University through a Comprehensive Scholarship Program

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Introduction

There is a lack of low-income community college students who successfully transfer to four-year institutions, graduate with an engineering baccalaureate degree, and enter the STEM workforce/graduate school [1,2,3]. To remedy this situation, the current project, funded through an NSF S-STEM grant, developed the “UC Irvine Pathways to Engineering Collaborative” to help low-income students from diverse backgrounds to successfully transfer to and persist in the engineering program of a four-year university. The designed program targets the population of students who have the ambition to pursue engineering degrees, but often lack the resources or exposure to engineering opportunities. The aim of the project is to a) increase the number of community college students who successfully transfer to an engineering major at a 4-year institution, b) improve the transfer student experience and persistence in engineering by providing co-curriculum cohort activities, c) promote increased graduation rates and d) foster participation in STEM careers and/or graduate studies.

UC Irvine Pathways to Engineering Collaborative: a S-STEM program

In 2019, the NSF-funded UC Irvine Pathways to Engineering Collaborative was established at the University of California, Irvine (UCI) and its community college partner Irvine Valley College (IVC) to help low-income students from diverse backgrounds to successfully transfer to and persist in an undergraduate engineering program.

The S-STEM program provides scholarships to community college students at IVC preparing to transfer to a 4-year institution (i.e., UCI) and to those who transfer into a declared engineering major at UCI. Thus, the scholarship recipients can receive scholarships for four years across their tenures at IVC and at UCI. In addition, any unclaimed scholarships at UCI are offered to transfer students from other community colleges.

Based on Tinto's model of student retention [4], the S-STEM program aims to enhance students' access, retention, and success by ensuring that students are academically and socially connected and integrated [5] through co-curricular activities [6]. Figure 1 highlights program activities provided to scholarship students throughout their tenure in the program. During the academic year, scholarship students receive individualized support through *faculty advising* and *peer mentoring*. The faculty and peer mentors are assigned on an individual basis, and they meet with their assigned scholar to provide guidance and support. In addition, students' academic advancement is supported by weekly *tutoring* opportunities (such as facilitated study groups) and *academic and career workshops*. Academic and career workshops are conducted to increase students' awareness about future educational and career opportunities and to prepare them for the STEM workforce. To ensure that S-STEM scholars are keeping on track throughout their undergraduate studies, they are also assigned STEM counselors that help develop and track their *individual education plans*. In addition to the activities throughout the academic year, annual summer bridge programs are offered to support bonding amongst S-STEM students at IVC and

UCI. The summer bridge program also allows transfer students to experience the academic culture and rigor of a university through project- based teamwork, and academic success workshops. Students are also actively encouraged and supported in pursuing *summer research or industry internships*.

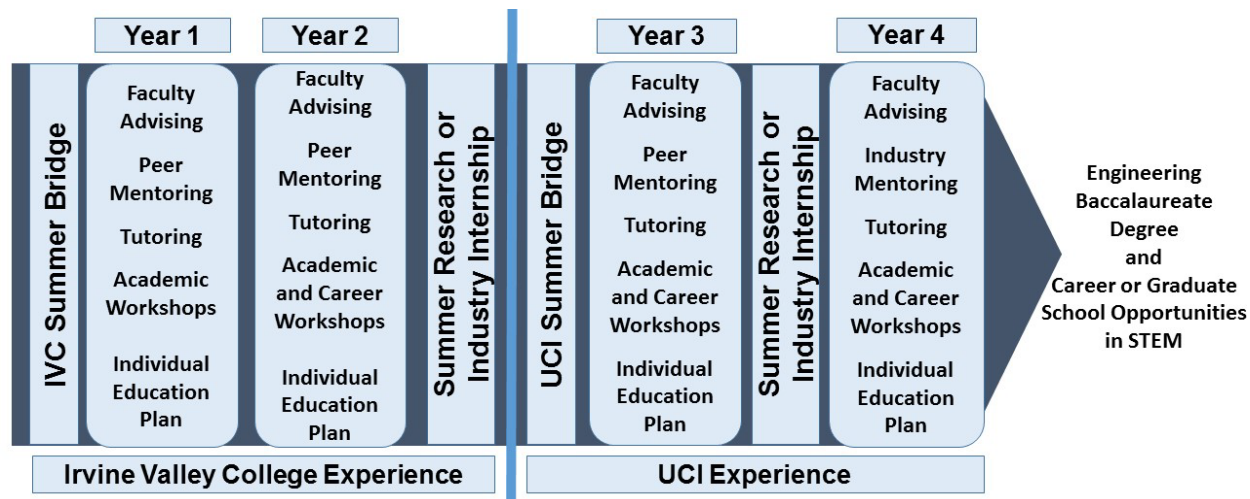


Figure 1. S-STEM program activities

Preliminary evidence for program efficacy

To examine the success of the program, in a first step we investigated whether the ‘UC Irvine Pathways to Engineering Collaborative’ increased the number of community college students who successfully transferred from its community college partner IVC to an engineering major at UCI. To assess the success of the scholarship program in providing students with an enriched environment fostering their success in the engineering program, we investigated S-STEM scholars academic performance at UCI. As the program is still ongoing, all presented results are preliminary. To further evaluate the success of the scholarship program, graduation rates of S-STEM scholars and their career paths after graduation will be investigated at the conclusion of the current five-year project period.

Transfer Admission rate

To assess whether the number of community college students who successfully transferred from its community college partner IVC to an engineering major at UCI increased throughout the project period so far, admissions data for UCI engineering applicants from IVC were investigated (see Table 1). The total number of IVC engineering students applying for transfer to the UCI engineering department as well as the number of students admitted to UCI’s school of engineering increased from 2019-2022 (see Column 2 and 3 in Table 1). Admission rates ranged between 61% and 69%. To investigate whether the development of admission numbers was uniquely different for IVC engineering transfer students compared to transfer students from other community colleges, the total number and percentage of engineering transfer students admitted to UCI from California community colleges overall were utilized as a comparison. Admission rates for UCI engineering applicants from IVC were almost double compared to the admission

rates of UCI engineering applicants from all other California community colleges (see Columns 4 and 7 in Table 1). This indicates that the ‘UC Irvine Pathways to Engineering Collaborative’ was successful in increasing the number of community college students who successfully transferred to UCI from its community college partner IVC.

Table 1. Admission rates for UCI engineering applicants from IVC versus all other California community colleges

	UCI engineering applicants from IVC			UCI engineering applicants from all other California community colleges		
	Total number of applicants	Admitted applicants		Total number of applicants	Admitted applicants	
	N	n	% ^a	N	n	% ^a
Overall	352	225	64	6786	2,534	37
<i>By year</i>						
2019	63	41	65	1644	557	34
2020	83	51	62	1719	590	34
2021	102	70	69	1776	693	39
2022	104	63	61	1647	694	42
^a admitted students/total students						

Academic performance

To investigate whether the transfer students receiving support through the scholarship program showed improved academic performance compared to other transfer students, participating S-STEM scholars at UCI were matched with transfer students with similar socioeconomic backgrounds that are not participating in the scholarship program. More specifically, propensity-score matching was used to find a matched control group of students with similarities in terms of their entry term at UCI, their low income status, their first generation college student status, their ethnicity, their previous school cumulative GPA, and their previous school units to compare to the S-STEM scholars. The matched pairs were then compared with regards to their quarter and end-of-year GPA.

While the program is still ongoing, preliminary analyses indicate that the transfer students enrolled in the scholarship program in the first two cohorts of the program outperform their matched counterparts in terms of GPA. The S-STEM scholars in the first two cohorts of the program (Cohort 1: Academic year 2019-2020, Cohort 2: Academic year 2020-2021) had a higher cumulative GPA than the matched control group in each quarter (see Table 2). The only

exception was S-STEM Cohort 2 in the Fall 2020 quarter (see Row 7 in Columns 3 and 4 in Table 2). Achievement data for the following cohorts will be analyzed and added in the future.

Table 2. Cumulative GPA for S-STEM Scholars and Matched Control Group for Academic Years 2019-2020 and 2020-2021

	Cohort 1		Cohort 2	
	S-STEM scholars (n=20)	Matched control group (n=20)	S-STEM scholars (n=25)	Matched control group (n=25)
	M (SD)	M (SD)	M (SD)	M (SD)
Fall 2019	3.00 (0.66)	2.84 (0.87)	--	--
Winter 2020	3.21 (0.45)	2.94 (0.83)	--	--
Spring 2020	3.35 (0.43)	3.00 (0.72)	--	--
Fall 2020	3.27 (0.41)	3.08 (0.41)	3.18 (0.62)	3.21 (0.72)
Winter 2021	3.30 (0.41)	3.15 (0.40)	3.41 (0.39)	3.33 (0.54)
Spring 2021	3.33 (0.41)	3.16 (0.42)	3.38 (0.42)	3.31 (0.53)

Conclusion

The preliminary results provide a first indication that the scholarship program is successful in achieving at least some of its objectives, i.e., an increase in the number of IVC community college students who successfully transfer to an engineering major at UCI and fostering students' academic success in the engineering program. To complete the evaluation of the program's success, further aspects will be investigated in the future (such as students' graduation rates, career plans and their assessment of their program experiences via interviews).

Acknowledgment

This material is based upon work supported by the National Science Foundation under Grant # 1742627. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

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