

## **Board 192: A Support System for Low-Income Students to Catalyze Diversity and Success**

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Dr. Stephanie Farrell is Professor and Founding Department Head of Experiential Engineering Education at Rowan University (USA). Prior to 2016 she was a faculty member in Chemical Engineering at Rowan.

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## **Abstract**

There is substantial opportunity for engineering graduates to enter the workforce to engage in a fulfilling career and achieve social mobility. Still, there is a lack of adequate support for low-income, academically talented students. The purpose of this poster is to describe the interventions designed to support S-STEM scholarship students at Rowan University in the first year of our S-STEM project. Our S-STEM project objectives are threefold: 1) Provide scholarships to encourage talented students with low incomes and demonstrated financial need to initiate and graduate from engineering majors in the College of Engineering at Rowan University and subsequently enter the engineering workforce or a graduate program; 2) Develop a support system that integrates multiple elements and services to foster a learning environment that motivates scholarship students to persist in their engineering studies; and 3) Foster an inclusive learning environment by engaging all engineering students in diversity, equity, and inclusion experiences and nurturing an equity mindset in student leaders through participation in training programs.

To accomplish these goals, we identified 10 low-income, academically talented students to receive scholarships. We also identified 80 additional engineering students who wished to participate in the Engineering Living/Learning Community (ELC). The scholarship students and other interested students were placed in the ELC starting in Fall 2023, where they are experiencing first year engineering as a cohort. This cohort experience includes required seminars, required attendance of Engineering I and Calculus I in a designated section, and the option of living in a shared dorm to facilitate further collaboration. Seminars that are part of the ELC are focused on adjusting to college life (e.g., time management, course registration, resume design) and diversity, equity, and inclusion subjects, including upstander training and coping with imposter syndrome. Scholarship students are also being encouraged to engage in leadership training offered through the University. This leadership training also focuses on DEI topics, and encourages students to be informed advocates.

Finally, this project is assessed by an external evaluator to determine the project's impact on students' motivation, sense of belonging, and equity mindset. Evaluation data involve pre- and post-surveys of all first-year engineering students, and focus groups of project leaders, ELC mentors, scholarship students, and other engineering students.

## **Background**

There is a nationwide need to improve experiences for under-represented/under-served (UR/US) students in engineering. Based on the persistent lack of diversity in science and engineering, the NRC 2011 report states "underrepresented [people] in [science and engineering]... currently embody a vastly underused resource and a lost opportunity for meeting our nation's technology needs." [1]. Similarly, the National Academies advocate that diversity in STEM must be a national priority to attract and retain the most talented individuals in STEM professions [2].

Although we have been very successful at increasing retention in STEM with the ELC (engineering learning community) established with prior S-STEM funding, Rowan University College of Engineering (CoE) faces challenges around diversity that are similar to those seen

nationwide. Black and Hispanic students, women, LGBTQ+ students, first-generation college students, and transfer students are represented in lower proportions in the CoE than in other colleges across campus. Furthermore, a 2016 baseline climate survey at Rowan University showed that these groups generally had lower participation in engineering-related activities, less inclusive classroom and overall educational experiences, more experiences with discrimination in academic spaces, and a less inclusive overall climate [3].

## **Project Overview**

We see an area of opportunity to foster appreciation and development of an inclusive learning environment at Rowan University by engaging all engineering students in diversity, equity, and inclusion (DEI) experiences and nurturing an equity mindset in student leaders through participation in DEI-focused programs.

Our S-STEM project objectives are threefold:

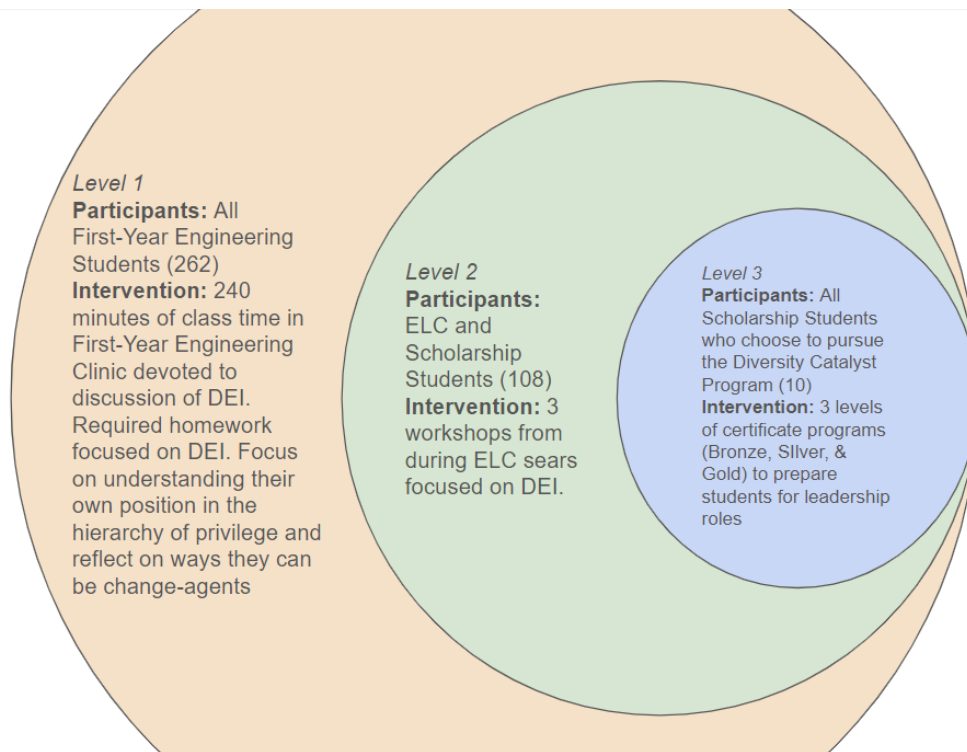
1. Provide scholarships to encourage talented students with low incomes and demonstrated financial need to initiate and graduate from engineering majors in the College of Engineering at Rowan University and subsequently enter the engineering workforce or a graduate program
2. Develop a support system that integrates multiple elements and services to foster a learning environment that motivates scholarship students to persist in their engineering studies
3. Foster an inclusive learning environment by engaging all engineering students in diversity, equity, and inclusion experiences and nurturing an equity mindset in student leaders through participation in training programs.

Objective 1 is being accomplished through offering scholarships to low income, academically talented students. Our first cohort of scholarship students (n=10) are receiving need-based scholarships up to \$10,000 per year. Scholarship students also participate in the Engineering Learning Community (ELC) (Objective 2), which is open to all first-year engineering students who express interest (n = 262 not including the 10 scholarship students). Objective 3 is being accomplished through three new initiatives: 1) Inclusive curriculum for all first-year students, 2) DEI-focused Engineering Learning Community (ELC) seminars, and 3) a University-run Diversity Catalyst Leadership program (DCLP) for Scholarship Students, which is also open to all engineering students (see Figure 1). These interventions aim to mold students into advocates and allies for DEI—an ethos they can carry throughout their time at Rowan University and into their future careers. Indeed, employers have indicated that awareness of and experiences with diverse cultures are attractive, but often lacking, attributes in STEM graduates [4]. Additionally, employers have identified leadership ability as a highly valued skill of engineering graduates [5, 6].

## **Study Design**

The project will support three cohorts of students and, at the time of this writing, the first cohort of students is close to the end of their first academic year. We have developed a pre/post-survey

tool to assess students' growth or change in motivation as well as an understanding, awareness, and behavior regarding DEI as they progress through the scholarship program. With student academic profiles being similar between Scholarship Students and non-Scholarship Students, a comparison in their pre-, and post-survey responses will be conducted using an Independent T-Test to determine what constructs demonstrate evidence of change. In addition, focus groups with the Scholarship Students will be conducted to explain and expound upon the survey results to further evaluate the Scholarship Student's experiences with the program interventions. Finally, tracking and monitoring Scholarship Students' experiences in the program will inform the variations and combinations of experiences (i.e., ELC, DCLP, etc.) that may influence persistence and DEI perceptions. Using correlations or regression analysis, this strategy can inform the combination of activities and experiences among the Scholarship Students in the ELC that resulted in persistence, graduation, and better DEI perceptions continuing beyond graduation. Using exploratory and confirmatory factor analysis on the pre- and post-survey data respectively, we will validate and test the reliability of the surveys to measure self-efficacy, sense of belonging, perceptions of the curriculum, and perceptions of DEI.



*Fig. 1: Three levels of DEI student intervention*

### **Data Analysis**

The pre-survey data was collected in the Fall 2023 semester, and is currently being analyzed using SPSS and R softwares. After data cleaning, results of the pre-survey indicated that there were 10 students in the S-STEM scholarship program, 91 in just the ELC, and 135 in neither. This represents a 100%, 84%, and 90% response rate for these populations, respectively. As

expected, comparisons between these groups did not yield significant differences. However, we expect that variations between the pre-survey and the post-survey results illustrate significant changes in persistence, sense of belonging, and self-efficacy among both the scholarship and the ELC students.

### **Project Status and Future Work**

At the time of writing, a pre-survey was administered to all first-year students in September 2023, and students of the first cohort successfully completed their ELC seminars for the Fall 2023 semester. The post-survey was administered in week 11 of the 14-week spring semester. Students of the first cohort are on track to complete the Bronze Leadership Certificate, which is the first phase of the DCLP, in either Spring or Fall of 2024.

### **Human Subjects Approval**

This work was conducted under Rowan University IRB approval, study number PRO-2022-237.

### **Acknowledgements**

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