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BOARD # 414: NSF S-STEM: Developing an Ecosystem of STEM success for Built Environment Scholars

Prof. Melanie Villatoro, New York City College of Technology

Melanie Villatoro, Professor and Chairperson in the Department of Construction Management and Civil Engineering Technology at NYC College of Technology, is a licensed Professional Engineer in the State of New York. She is passionate about student retention and performance, as well as STEM Outreach from the elementary to the high school level.

Dr. Muhammad Ummy, New York City College of Technology

Dr. Muhammad Ummy is a full professor of Electrical Engineering Technology at New York City College of Technology. He received his B.E. in Mechanical Engineering from the City College of New York in 1997 and his Ph.D. in Electrical Engineering from Graduate Center at the City University of New York in 2008. Dr. Ummy's research focus is on design of both low and high-power SOA-based fiber Laser system. He is currently working on Terahertz generation using Lithium Niobate crystals. He has published over twenty peer-reviewed journal articles, and two book chapters. Dr. Ummy has presented his research to several international conferences. In addition, he has three U.S. Patents. He is a Co-PI been sponsored by DOE, NSF and CUNY Strategic Investment Initiative (SII).

NSF S-STEM: Developing an Ecosystem of STEM success for Built Environment Scholars

Melanie Villatoro[1] Muhammad Ummy[1] Hamid Norouzi[1] Masato Nakamura[1] Daeho Kang[1]

1 New York City College of Technology

Abstract

The National Science Foundation S-STEM program, Developing an Ecosystem of STEM success for Built Environment Scholars (Award Number 2150432), focuses on supporting and developing scholars in the majors relating to the Built-Environment which include Civil Engineering Technology, Construction Engineering Technology, Electrical Engineering Technology, Mechanical Engineering Technology and Environmental Control Technology. The intent of the project is to implement evidence-based effective practices and assess the impact of these practices, degree attainment, and entry into the U.S. workforce or graduate programs in STEM. Students are provided faculty mentors and opportunities to engage in cohort building activities that include field trips, research, workforce internships, and networking sessions. The project began in 2022 and has successfully recruited four cohorts of students within the programs first two years serving a unique cohort of 72 students to date, 30 of which have graduated.

Keywords

mentoring, high-impact practices, cohort-building, retention

Introduction

New York City has one of the most vibrant ecosystems for new startup fields and a fast-growing environment for creating jobs. Therefore, an up-to-date infrastructure and built environment in this ultra urban city is vital to maintain its vibrancy. Built-environment majors are typically used to describe the interdisciplinary field that addresses the design, construction, management, and use of these man-made surroundings as an interrelated whole as well as their relationship to human activities over time

The S-STEM program, Developing an Ecosystem of STEM success for Built Environment Scholars (SSTEM BES), focuses on supporting and developing scholars in the majors relating to the Built-Environment housed in the Departments of Construction Management and Civil Engineering Technology (CMCE), Electrical and Telecommunications Engineering Technology (ETET), Mechanical Engineering Technology (MET), and Environmental Control Technology (ENVC). These majors include Civil Engineering Technology, Construction Engineering Technology, Electrical Engineering Technology, Mechanical Engineering Technology and Environmental Control Technology. The principal goal of the SSTEM BES is to increase low-income students' retention and graduation rates and their prospects for graduate studies and placement.

Background

Reports in the recent literature suggest that the continued capacity of the current and future STEM workforce to meet the nation's scientific and technological needs is threatened by a sharp decline in the number of available STEM professionals. Reports from the Committee on STEM Education of the National Science and Technology Council (2013, 2018), Fayer et al. (2017), National Research Council (2010, 2011, 2012), highlight: 1) the importance of STEM to the nation's well-being, security, and global competitiveness; 2) the need for equity, access, increased enrollment, and diversity in STEM disciplines, and 3) the current and projected increase in STEM workforce shortage.

Educational inequality contributes to income inequality and declining social mobility. In 2014, the White House issued a report stating the urgency to increase college degree attainment for low-income students. (Office of the President 2014). Degree attainment is much lower for people from low-income families as compared to those from high income families (Bailey and Dynarski 2011). This becomes problematic because without a college degree, children born in the bottom fifth of the income distribution have only a 5 percent chance of making it to the top fifth, and a 55 percent chance of making it out of the bottom fifth. With a college degree, the chances of making it to the top increase to 19 percent, and the chances of making it out of the bottom increase to 84 percent (Isaacs et al., 2008).

Program components

The SSTEM program provides scholarships to low-income students supplemented by activities and support systems to help them graduate on time prepared to enter the workforce or graduate school. The Promote S-STEM Scholars' academic success through cohort development, faculty mentoring, and engaging Scholars in activities such as workshops, field trips, research, workforce internships, and networking sessions.

Scholarships - Each scholar is awarded an annual scholarship for a period of three years if they maintain eligibility and timely progression towards degree completion.

Mentoring - Scholars are given consistent faculty mentor throughout their participation in the grant. Mentoring includes: (1) course advisement and progress meetings to identify early concerns; (2) oversight of optional summer research experience; and (3) guidance through the process of career counseling and job placement services.

Cohort building – Scholars participate in a variety of cohort-building activities with the goal of developing a strong sense of belonging, particularly challenging for a commuter campus. They participate in the following events: (1) welcome event and program orientation; (2) annual networking luncheon; (3) field trips; and (4) professional, industrial or scientific meetings, and conferences.

Undergraduate research – Scholars are provided opportunities to participate in undergraduate research and receive an additional stipend. Students participate in workshops to prepare them for entry into the workforce or pursuit of advanced graduate studies.

Internship - Scholars will be provided opportunities to participate in internship experiences and receive an additional stipend. The SSTEM program has established industry partners that provide these experiences to the student.

Cohorts

To date, we have recruited four cohorts of students, totaling 72 unique students (30 graduates to date; 42 current Scholars). Figure 1 summarizes the breakdown of each cohort.

Figure 1: Cohort Summary

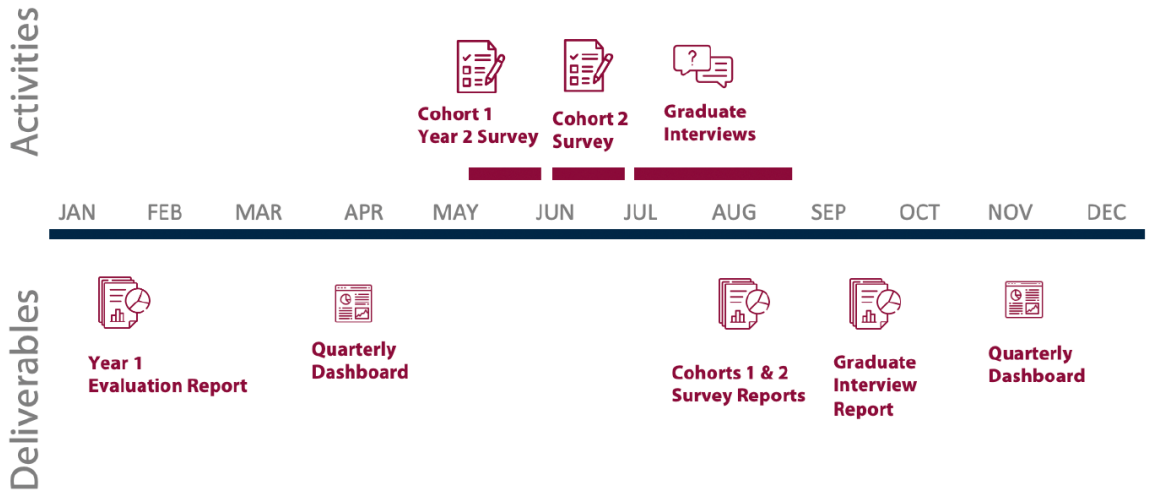
	Cohort 1	Cohort 2	Cohort 3	Cohort 4
# S-STEM Scholars	20	15	18	19
# Graduated (to date)	13	9	8	0
Date started	Spring 2022	Fall 2022	Fall 2023	Fall 2024

In order to be eligible to apply for the SSTEM program, students must: (1) be a U.S.citizen, permanent resident, nationals, or refugee; (2) be enrolled full-time in a program leading to a degree in one of the Built-Environment majors; (3) demonstrate academic ability or potential; and (4) be eligible for Federal Pell grant.

Evaluation

The program is evaluated on an annual basis using a variety of data collection methods, including enrollment, retention, and graduation data, pre/post surveys, interviews, and cohort tracking.

Figure 2: Evaluation Plan



Results

Students both currently in the S-STEM program and those who have recently graduated feel strongly that this program has helped them immensely in their academic development in their fields of study and their professional development. Internship, networking, and research opportunities are often highlighted as greatly expanding the students' experience in the program. Only one scholar has transferred out of the program, 99% of scholars have been retained in the built environment majors and 42% have graduated.

The Fall 2023 Graduate Experience Survey was distributed in Spring 2024 with an 85% response rate. Below are summarized findings.

- 100% of respondents rated their experience with the S-STEM program 8 or higher (on 1 to 10 scale), with 80% giving the program rating of 10 (extremely valuable).
- 50% of respondents are currently employed, while 17% were not employed at the time of survey, but had upcoming job commitments.
- When asked about their overall experience and benefits they received from participating in the S-STEM Building Environment program, respondents expressed the high value of the mentoring they received and the benefit of the financial assistance the program provided. Respondents also indicated impactful benefits from the networking opportunities and job opportunities/employment awareness that the program provided.

The Fall 2024 Student Experience Survey was distributed in Summer/Fall 2024, with a 77% response rate. Below are summarized findings from current students in Cohorts 1, 2, & 3.

- The overall program rating was an average of 9.78 (on 1 to 10 scale) and respondents reported an average rate of 9.67 on the value of the S-STEM Built Environment program on their academic and professional development.
- 42% of respondents reported a projected graduation date of Fall 2024.
- 55% of respondents are currently employed, and 64% of those currently employed are working directly in their field of study or related field of study.
- Overall, students identified internship opportunities, faculty advising and mentoring, and research experience as the most valuable benefits of participating in the S-STEM Built Environment program.

Recommendations for Improvement

The SSTEM program is ongoing and the evaluation tools are also used to identify areas of improvement. Student feedback through surveys and interviews identifies the following:

- Respondents recommended recruitment strategies included: Current S-STEM Scholars to act as ambassadors to potential program participants; program promotion through effective marketing; host informational workshop sessions, incorporating hands-on activities.
- Respondents recommended peer community building strategies: Informal gathering activities (social events, community service projects, field trips); networking events with present/past students and faculty; increased activity on LinkedIn group page; "Electrical hobby hours" (opportunities to interact and display DIY projects).

- Respondents recommended mentor community building strategies: Informal gathering activities (potluck dinners, lunches, sports events); projects fairs where students display projects and connect with mentors/collaborators; field trips to companies of interest to S-STEM majors; TEDx-style talks/workshop sessions; panel discussions with mentors sharing experiences; regularly scheduled mentorship meetings/gatherings.
- Participants in the S-STEM program highlighted several key recommendations, including increasing the frequency of networking events, establishing hands-on workshops, offering technical skills courses, and organizing sessions where faculty members can share field experiences with students.
- Program promotion and field trip timing were the most highlighted for the areas needed for improvement of the S-STEM program

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