More than a summer bridge program

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Sehba Hasan is an engineer, educator, and advocate committed to equitable STEM education. She holds a Bachelor of Science in Electronics and Telecommunication Engineering and an MBA in Management . She is currently a Ph.D candidate in STEM education. Sehba's career reflects her passion for inclusive STEM programming and innovative teaching methods. Her experience includes roles as an Engineering Instructor an Assistant Trio Director and an Associate Director. She played a crucial role in guiding underrepresented students through higher education and developed STEM curricula. Sehba's leadership shines through her involvement in the Bridge to Engineering Success at Tufts (BEST) program and her work as a Robotics Head Coach. She is also dedicated to expanding STEM education and has created technology-based programs for low-income students. Her journey is a testament to her commitment to educational equity and inclusive STEM opportunities.

More Than a Summer Bridge (Work in Progress)

The Bridge to Engineering Success at Tufts (BEST) program was established at Tufts University to support underrepresented students. BEST focuses on providing holistic support to the underrepresented student population throughout their entire undergraduate journey. In addition to academic assistance, the program takes into consideration students' emotional, social, and financial needs. As the scholars progress through their four years of college, they face different sets of challenges at different steps. Research suggests that engineering colleges need to offer continuous support for students throughout their studies, particularly at the academic levels of the program (Cançado, Reisel, & Walker, 2018). BEST aims to bridge the gaps of its scholars' undergraduate journey at different levels. Hence this program is more than a summer bridge. The BEST program helps an underrepresented student acquire a sense of belonging, find community, get acclimated to the college environment, adapt to a rigorous curriculum, and develop leadership skills.

Admitted students are invited to apply to the BEST program. Students fill in the application form that comprises basic questions designed to gauge their fit for the program.Teamwork, continued interest in engineering, and resilience are some of the qualities sought through this process. Students admitted in the program are called BEST Scholars. Each year we admit around 10-15 students in the program. The program works to foster community by incorporating social activities into the summer program and throughout the academic year.

The Initial Summer

Students begin their undergraduate journey by participating in BEST summer before their fall semester matriculation. The BEST summer program provides students with round-trip travel to Tufts University, room and board, and three credit-bearing courses at no cost to the scholars. Resource workshops conducted during summer help students become familiar with various resource centers on campus such as the financial aid office, counseling and mental health services, career center, office of equal opportunity, and identity centers. The President and Dean of Engineering school are invited to welcome the students as they begin their journey at Tufts. Engineering workshops introduce scholars to the different engineering departments, offering them insights into potential majors or minors. Field trips to the greater Boston area, such as visits to museums, volunteering at local food banks, escape rooms, and amusement parks, foster community-building and social responsibility. BEST scholars also receive early registration to fall courses. This opportunity is designed to bridge digital disparities and ensure students can register for courses of their liking.

Following the summer program, BEST continues to provide robust support through the four years. Programming is centered around themes for each year. The first year focuses on social integration, sophomore year on engineering major exploration, junior year on career preparation, and senior year on academic refinement and expedition.

The First Year

First-year BEST scholars are supported through a pre-major advising group that helps them understand the academic environment, course expectations, and selecting a major. They also receive tutoring for two core STEM courses in both fall and spring semesters. These sessions reinforce classroom learning, offer a space for questions, and foster a collaborative learning environment among peers. Tutoring helps students understand lecture material, prevent procrastination, and prepare for exams (Louie, Knight, & Sullivan, 2011). Academic coaching is mandatory for first-year scholars and available to upperclassmen on an as-needed basis. Academic coaching covers topics such as time management, note-taking strategies, and academic goal setting.

Each first-year BEST scholar is paired with an upperclassman peer mentor based on their intended major and interests. Mentors and mentees receive a peer mentoring handbook, attend training, and participate in activities together to build a strong BEST family dynamic. Mentors meet individually with their mentees to provide guidance, answer questions, and offer insight into specific classes, majors, and experiences at the school. A BEST Seminar class meets twice per week during the fall semester, covering topics such as asking for help, safe spaces, major exploration, time management, core values, leadership development, biases, microaggressions, self-representation, and mentorship. The seminar provides students with a space to discuss challenges they face at a predominantly white institution (PWI) campus while fostering self-esteem and self-efficacy. Research shows that underrepresented college students' responses to social, cultural, financial, and intellectual stressors are often perceived as passivity by faculty, who may not fully understand the challenges these students encounter (Vivian, 2005). The seminar's second day of each week is focused on connecting faculty, staff, and senior leadership to the specific challenges faced by BEST scholars. This is achieved through inviting faculty, staff, and senior leadership as panelists on the second day of the weekly seminar class. Students get an opportunity to ask questions and relay their challenges to panelists. One of the events with the president of the school invites all scholars to give a short speech on the topic “Importance of STEM in the life of underrepresented minorities”. Students have expressed their emotions and hurdles they have faced while pursuing higher education in STEM. The purpose of all this is to work collaboratively to find solutions. Research highlights the importance of addressing topics such as self-identity and other challenges to create safe spaces for minority and underrepresented students (Redd, 2018). Motivational speeches are incorporated into the seminar to boost student morale.

Second through Fourth Years

The BEST program offers a variety of workshops designed to support the personal and academic growth of its scholars. Financial literacy workshop focuses on managing finances, creating budgets, and understanding student loans and credits. The resume writing workshop prepares students with the skills to craft professional resumes that highlight their academic achievements and extracurricular experiences. Personal statement writing prepares them for interviews. The program also offers sessions on study abroad opportunities, helping students navigate the application process and understand the benefits of global experiences. Workshops on academic standing and academic integrity teach students how to monitor and maintain their academic

performance, as well as how to uphold ethical standards in their coursework. Degree audit workshops help students with course selections for the upcoming semester, ensuring timely graduation and helping with reserving courses for masters' programs. These workshops are integral to preparing students not only for their immediate academic journey but also for their long-term success in their careers and personal lives.

Industrial visits have been added to the BEST program, providing scholars with opportunities to explore career options by visiting various companies, meeting with their Human Resource staff, their employees, and getting a tour of the company. The key goal of this initiative is to gain industrial insights, introduce students' talents to the industry, and establish a pipeline for summer jobs and internships. This interaction with industry professionals can help students gain insights into the industry and clarify any doubts they may have about the profession (Super et al., 2023). These visits help scholars understand company culture and inform their career decisions.

STEM Project Fair provides an opportunity for BEST scholars to showcase their skills and engage in research and presentations. It helps prepare students to participate in national science fairs and competitions, presenting their work to a broader audience. The goal is to develop public speaking and critical thinking skills while gaining recognition for their work. The project could be anything they have done in their engineering class, a poster, or even something they have done in high school. This fair aims to underscore the scholars' efforts and attempts they have made towards STEM.

The BEST program emphasizes holistic support and recognizes scholars' achievements. BEST program offers fifty percent scholarships for summer study abroad programs to its scholars. This program wants their scholars to experience new cultures and different learning environments. The program recognizes scholars who earn a spot on the dean's list each semester by awarding them checks. BEST allocates some amount of money to each student through Education Enrichment Funds which allow students to purchase things not covered through financial aid.

BEST program has a good graduation and retention rate. From 2010-2018 the overall graduation rate of BEST scholars was 91% compared to 85% for all SOE underrepresented students. Even more compelling is that from 2021 and 2022, 100% of students enrolled in the BEST program graduated from SOE in four years.

Based on the respondents of a recent survey, 81% of BEST alumni are working in the engineering industry, 13% are pursuing a master's degree, and 3% are pursuing a Ph.D. Additionally, of the 2025 graduating cohort, 8 of 12 BEST Scholara have applied and been accepted into the 5th year master's program at Tufts.

The BEST program has successfully completed 15 years of serving students and there is still room for growth. Expanding the program to serve more students is a key goal. Post-pandemic, there is a heightened need for additional programming to address the damage caused by the pandemic and mitigate the learning loss experienced during that time. Tutoring sessions can be expanded to support sophomores, juniors, and seniors, while the BEST seminar can be broadened to introduce topics relevant to upper class scholars. Introducing a faculty and alumni mentorship program would allow current scholars to benefit from the expertise and experiences

of both. We also aim to expand our industrial visits beyond the state, reaching industries nationwide and globally. To enhance the program, we plan to provide funding for students to attend conferences and create opportunities for them to participate in hackathons.

The BEST program is a small attempt to bridge the gaps faced by underrepresented students in an academic environment. There is greater work that needs to be done to eliminate or close these gaps that are brought about by systemic negligence of this population for years together. Through this program we want to give students equal access to learning opportunities and prepare the students for a STEM world.

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