DEI Task Force Accomplishments: The DEI Scholars Program and its DEI Elective Option

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Motivation and Background

The purpose of this practice paper is to share new accomplishments made by our Diversity, Equity, and Inclusion (DEI) Task Force in the Mechanical Engineering and Applied Mechanics (MEAM) Department within the School of Engineering and Applied Sciences (SEAS) at the University of Pennsylvania. This paper aims to enable others to implement similar changes adapted to their own contexts. Previously, we shared the process of forming a DEI Task Force within a Mechanical Engineering Department [1], [2] and described initial efforts at programming and engaging students [3]. This previous work focuses on the how-to parts of convening the task force, determining goals, and describing challenges. In this paper, we focus on two specific efforts within the DEI Task Force: a DEI Scholars Program, and a DEI Elective Option which is an outcome of the DEI Scholars Program.

The DEI Task Force regularly convenes to tackle immediately pressing DEI issues within the department and to develop a longer-term plan for improvement and change for all matters relating to DEI [website link]. Every semester the makeup of the DEI Task Force changes as new DEI Scholars join, others graduate, and faculty and staff are added. This evolution of the Task Force itself has led to an evolution of the type of projects we address and also the way in which we pursue them. The conversations and brainstorming that happen organically in these meetings tend to plant the seeds of future change. Task Force members then take turns cultivating these ideas and help to shape the process of implementation from idea to reality. One such idea, the DEI Scholars Program, was seeded by a similar program in a separate department within [school at university]. The process of growing and adapting this idea made it uniquely suited to support students in our department while also creating opportunities for more systemic impact.

Although DEI programs have lost funding in some states, our DEI Scholars program has proven resilient and students are still interested in facilitating meaningful change within their department and within the school of engineering.

DEI Scholars Program

The DEI Scholars Program provides opportunities for mechanical engineering students (undergraduate and graduate) and postdocs to make an impact on DEI efforts in the department. DEI Scholars and Associates propose and execute projects in collaboration with department faculty and staff. While the proposed projects could be grand in vision, the DEI Task Force members selected projects that could first be implemented at a smaller scale in the mechanical engineering department.

Projects were also selected in part based on their ability to create systemic change in the department, rather than activities relying solely on the DEI Task Force itself. The overarching goal is for projects to become self-sustaining programs, or policies and procedures adopted by the department. Successful projects can also be replicated by other departments within the school in the future: The DEI Scholars Program would effectively operate as a student and postdoc-led "incubator," or test space, so that programs could be expanded to other departments in the school.

To counteract the effect of the "minority tax" [4], DEI Scholars (the project leads) and Associates (project support team members) receive a funded scholarship. Launched in 2021, the program has supported 7 DEI Scholars and 10 Associates over 3 cycles, leading to 3 major DEI initiatives. The program has also grown in that 2 Associates have successfully been promoted to the Scholars positions of their respective projects.

The DEI Scholars Program Projects

The first three approved projects focused on creating awareness of DEI issues in the department, both to make the department more inclusive for students and to provide students with knowledge of DEI issues. Two of the projects focus on creating community within the department. While the department has active mechanical engineering student groups, the DEI Scholars Program projects create specific spaces for students to discuss cultural and identity issues within engineering, both within the school and outside of academia. An Undergraduate Mentoring project has worked to bring students together to discuss DEI issues directly pertaining to them, to connect students, and to report concerns back to the DEI Task Force and department.

A Graduate Student Outreach project has connected admitted graduate students with mentors during the admissions process. Prospective students are invited to meet with mentors who can talk about what it is like to be in the department while identifying with a marginalized community or identity group. While no one is turned away if they ask for support, prospective students have tended to self-select based on the nature of the invitation. In other words, this project has predominantly supported individuals self-identifying as women or people of color.

The third project focuses on creating recognition for students interested in DEI-related course topics through a DEI Elective Option. Our DEI Scholar worked with faculty and staff to build DEI topics into students' existing curriculum requirements. As an "Option," this project also allows the department to assess need and student interest before advocating for creating a more formal certificate or minor program. Here, we will expand on this project, which has involved many layers of stakeholders: students, faculty, staff, and school administration.

Case Study: DEI Elective Option

The DEI Elective Option allows Mechanical Engineering undergraduate students to dedicate a portion of their existing degree requirements towards learning about identities and experiences different from their own, the impact of technology on all people, and how supporting DEI looks on a local, national, and global scale. The goal is to mold graduates who will practice their professions in ways that serve all, including members of underrepresented, underserved, and disadvantaged communities. In this way, students gain tools to foster an inclusive culture and mindset in their future industry jobs, startups, research endeavors, project teams, communities, and beyond. The DEI Elective Option was approved by the department and launched in the fall of 2023.

Mission and Creating the "Option"

The idea of providing the DEI Elective Option evolved out of the desire of one of the DEI scholars to help the department provide mechanical engineers with an education that allowed them to apply and consider issues of equity, differences in human ability, and differences in socioeconomic status to the design and development of technology. It was noted that being able to expose students to DEI topics would help them use their engineering education to impact individuals at all levels of society.

In particular, an elective "Option" was chosen over a minor or certificate, as done in other institutions, to avoid administrative burdens and to address concerns about engineering students overloading themselves with additional course requirements. We also discuss the process of creating and obtaining approval for the program, including handling faculty and administrative reception and securing broad buy-in for the proposal.

Our DEI Scholar created a reference list of like-minded universities such as MIT that included DEI electives, courses, or concentrations as a part of their engineering curriculum. This list served as template options for how we would frame our intervention. We also surveyed the number of classes across the institution that 1) discussed DEI-like issues such as those around, culture, gender, ethnicity, disability, and socio-economic status, and 2) had technical design components that asked students to consider cultural, societal, human capability, or socio-economic status before developing technology ideas. Over 100 courses across the university were considered and a proposal was put forth and reviewed by the mechanical engineering department.

One point of discussion was whether to offer this academic option as a Minor, rather than an Elective. Consultation with faculty and academic support staff who work with students led to the decision to focus on the Elective Option. First, a Minor would involve six required courses, not just four. Furthermore, while the Elective Option can be completed without taking *any* extra

courses (since it co-satisfies the existing Elective requirements of the mechanical engineering Bachelor's degree), the Minor would typically require additional courses beyond the required ones. This potentially creates a barrier for some students, and causes others who are interested in the topic to overload themselves; such overloading has been an increasingly frequent problem for students whose ambition leads them to set unrealistic targets for themselves. Additionally, a Minor requires approval at the level of the School, requiring more time for review and approval. As an "Option," the Elective Option could be approved and executed solely within the department, leading to more rapid implementation. For these reasons, the Elective Option was chosen as the preferred academic pathway.

DEI Elective Option Curriculum

The DEI Elective Option requires students to take 4 elective courses selected from a pre-approved list from the DEI Task Force. The regular Mechanical Engineering undergraduate curriculum requires students to take at least 7 non-engineering elective courses, and most of the courses in the DEI Elective Option can also be counted as these electives, meaning that students can fulfill the requirements of the Option without taking additional courses. Again, the Option *incorporates* DEI issues into the existing curriculum, rather than create an add-on for students.

Courses taken for the Option all must be taken for a grade (not pass/fail) and in the following three areas:

1. **Impact of Technology** (1 course): These types of courses help students focus on how technology impacts marginalized communities. Examples of such courses are courses entitled "Race, Science, and Justice" and "Rehabilitation and Robotics." These courses allow engineers to assess the needs of society and its marginalized communities and develop strategies to ensure that future technology solutions consider them.
2. **Community Impact** (1 course): These courses help students to develop and apply their knowledge of the interaction between technology and marginalized communities to have a positive impact. An example of this course could be an independent study course designed to help students formulate a proposal to perform service-learning work in the community that applies engineering principles and practice under the guidance of a faculty advisor.
3. **Depth** (2 courses): These courses incentivize students to choose from over 50 courses from a wide range of departments that will expose them to people, identities, and cultures outside of their own. Students can choose to examine issues in "Social Class/Economic Inequality", "Disability/NeuroDiversity", "Gender/Sexuality", and "Race/Ethnicity."

In the Fall 2023, several undergraduate students expressed interest in the DEI Elective Option, but have not yet taken enough courses to declare and claim the recognition. Moving forward, the

current DEI Scholar is reframing the promotion of the Option, making the value proposition clearer, and emphasizing how the Option works with students' curriculum plans, rather than creating additional course requirements.

Future Steps: Refining the DEI Scholars Program

Using data and feedback on the initial student reception to and participation in the program, we conclude by discussing potential future challenges and ideas for overcoming them.

A key aspect of the DEI Scholars Program is that we now model it as an "incubator" type program, inspired by an approach to innovation commonly used by engineers in both academia and industry: some projects may take hold and transition to sustainable programs integrated into the policies and practices of the department, while others that have not gained sufficient traction, interest, or success are sunset, but with lessons learned in the process. This has the benefit of tapping into and helping further develop the entrepreneurial mindset, and the spirit of research and experimentation, of the students themselves. Thus, the program offers a pedagogical benefit to the participants.

To accomplish this, the DEI Task Force (including the Scholars themselves) will continue to assess the success of each project using both quantitative and qualitative means. We have already been doing this for the sake of improving the ongoing projects, but by the end of the current semester (spring 2024), will aim to make decisions on the future course of each project.

Incorporating Data

As we progress in these projects, we have started to collect all relevant data (*e.g.*, the number of enrollees in the DEI Elective Option and what courses satisfy the requirements they have taken so far; the number of prospective students contacted by Admitted and Current Graduate Student Outreach project) and survey stakeholders (Scholars, students, faculty, staff) to assemble their feedback on the operation and impact of the projects. These data and feedback will be discussed by the DEI Task Force to determine if a project should be sustained. If so, the DEI Scholars, their faculty advisors, and departmental staff will meet to propose and implement changes to departmental policies and practices.

Some unintended data has come in the form of questions that our students posed to the Scholars. In graduate recruitment, questions about how we define communities and identities of interest, such as "Under-Represented Minorities" (URM), have shaped how outreach takes place. The changing definitions of terms and how students choose to self-identify, alongside policy changes to how the University may collect demographic information of applicants, have required meaningful conversations within the DEI Task Force, and ultimately, adjustments to outreach strategies.

We have also taken qualitative observations from the Scholars and Associates to help us better define the needs of the department and Engineering school. In promoting the DEI Elective Option, the Scholars and Associates found that students in different areas of engineering, e.g. Bioengineers versus Mechanical Engineers, see the need to incorporate DEI efforts differently. Individuals more likely to work directly with end-users showed more initial interest in DEI course topics. Many students also misinterpreted participating in DEI efforts as an identity group itself, and resisted pursuing the Option for fear of being labeled as a "DEI person." An offshoot of this label was also one that could be read as weak or emasculating for men.

Next Steps

We have just issued a solicitation for new project ideas to be executed by a new cohort of Scholars and Associates, with Scholars to apply for this by the late Spring of 2024. This will be followed by Scholar/project selection before the end of the Spring 2024 semester. Then, the Scholars will lead the solicitation for Associates in the early Fall of 2024. Collectively, this timing cycle maximizes opportunities for student involvement and engages the Scholars themselves in the process of recruiting new participants to support their project ideas, giving them a sense of ownership, responsibility, leadership, and mentorship. For this cycle, we plan to refine the selection process to account more strongly for the feasibility, assessment methods, and sustainability of the proposed project ideas. This includes requiring existing Scholars to submit new applications to continue their work (or to pursue new ideas) as well as fully considering applications from new potential Scholars.

We also will undertake further assessment process of the program itself. So far, assessment has been mostly qualitative. Scholars have presented progress reports to the DEI Task Force, and the Scholars, their faculty mentors, and the leadership of the DEI Task Force have assessed the progress made. The work of the Task Force, particularly the DEI Scholars' projects, was presented to the Department's External Advisory Board (consisting of alumni and other supporters in industry and at other academic institutions) in the fall of 2023, and solicited questions and feedback from them, and this feedback was shared with the Task Force. Looking ahead, more formal assessment methods will be formulated. The Task Force will seek guidance from SEAS' Office of Diversity, Equity, and Inclusion on best practices to conduct this assessment.

In summary, the engineering-focused pedagogical approach of this DEI Task Force, the student-centered structure of its activities, the path from Associate recruitment to potential promotion to Scholar, and the program's overall relative simplicity provide a model to enable other academic programs to implement similar approaches to promote DEI efforts and create sustainable change.

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