Board 133: Work in Progress - A Pilot Course on Effective and Enduring Advocacy: Leading with Compassion in STEM

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Meredith Hooper is an Aeronautics PhD student studying under Professor Mory Gharib and Co-Director of the Caltech Project for Effective Teaching (CPET). Her PhD research uses a combination of machine learning and experimental techniques to investigate optimal modes of propulsion, spanning interests in both bioinspired propulsion and classical aviation. In her role as Co-Director of CPET, Meredith works closely with the Center for Teaching, Learning, and Outreach to coordinate and lead a variety of workshops, speakers, discussions, and more. These events support a community of graduate students and postdocs passionate about becoming effective educators through an improved understanding of research-based pedagogy.

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Harly Ramsey is an Associate Professor of Technical Communication Practice and the Associate Director of the Engineering in Society Program at the University of Southern California's Viterbi School of Engineering. She holds a Ph.D. in English, and her training in narrative theory, cultural studies, and rhetoric informs her teaching and scholarship. Her current research investigates students' perspectives on their transition to the workforce; she also studies student metacognition and self-regulation. She developed and continues to work on Engineering Moment, a co-curricular podcast project about the social role of engineering, and Vision Venture, a video series exploring students' engineering identities, agency, and purpose after graduation.

Dr. Morgan Hooper, University of Toronto

After completing her PhD at the Graduate Aerospace Laboratories of the California Institute of Technology (GALCIT), Morgan Hooper is now an Assistant Professor (Teaching Stream) at the University of Toronto. There, her teaching focuses on building community within hands-on Engineering Design courses and beyond. She encourages students to engage with multi-faceted, trans-disciplinary engineering projects to learn the complex ways in which engineering, design, and community interact.

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Introduction: Advocacy in Engineering

Advocacy work comes with no obvious roadmap. The scale of the challenges facing our world can feel overwhelming, and there are no straightforward solutions. However, advocacy – actively transforming the lived experiences of people and the planet we reside on, as well as allowing ourselves to be transformed in turn – is central to the practice of science and engineering. Engineering training prioritizes problem solving and analyzing complex systems, which uniquely positions engineering students to contribute to a wide range of challenges and make direct impacts on their communities and our world. Despite this, community-centered advocacy work is often framed as extracurricular rather than an essential aspect of engineering curricula and leadership development.

There are clear advantages to acknowledging the transformative power and social responsibility of the engineering profession in an engineering education setting. Offering opportunities for students to make connections between their professional expertise and the communities they can impact can help foster a culture of belonging [1, 2, 3]. In tandem, opportunities for leadership development which leverage students' existing engineering identity may bolster the belief that engineers can be effective agents of change [4]. To promote this within our institution's engineering department, we have developed a pilot course offering that aims to guide students in embracing their role as active participants in shaping our world by augmenting the technical and critical thinking mindset integral to an engineering identity with tools grounded in critical consciousness and compassion. Developing critical consciousness translates to an increased awareness of inequitable systems and opportunities to further freedom and prosperity, while compassion elicits the self-belief and care for others that drives change.

Related Initiatives

There is a wide range of ongoing initiatives that integrate community, social, and/or socio-technical aspects with engineering critical thinking and leadership, from global initiatives like the "How to Change the World" programming [5] to our own nearby community college's programs that address locally relevant environmental and social justice challenges. On an institutional level, Colorado Schools of Mines has developed a Humanitarian Engineering program which "educates engineers and scientists to work as partners with communities seeking to enhance their social, environmental, and economic sustainability". They have developed resources to transform engineering education and practice for community development, and explored how Science and Technology Studies can help students think critically about their social responsibility [6, 7]. At our own institution, steps are being taken to incorporate more

socio-technical topics by offering new elective courses such as “Sustainable Engineering” and “Environmental Justice”. We aim to take our institution’s efforts a step further by giving students the opportunity to examine the potential tensions that can arise when learning about injustice (especially tied to, or even perpetuated by the fields in which we work [8]), and to provide them with tools for creating real, sustaining, positive change.

It is important to note that students already carry out critical, change-making advocacy; for example, many students seize opportunities to hone their leadership skills by affecting change within their communities, with varying levels of formal recognition. The creativity, passion, and leadership required for advocacy both within and beyond a technical discipline should be endorsed as a valuable, even essential, aspect of a student’s education. Therefore, we are not only interested in uplifting students through discipline or institution-specific advocacy efforts, but we also want to explore a means for engineering students to receive formal training and credit towards serving external communities or causes with personal relevance to them.

Purpose of Current Initiative

Our goal is for students to view their social awareness and responsibility, their strengths and interests, and their problem-solving and systems-thinking skills as equally important aspects of their selfhood, and that they begin to integrate these aspects into their developing engineering identity. We are also curious to see what opportunities and challenges arise when we bring a spectrum of diverse student advocates together in a community that prioritizes caring and critical reflection, action, and dialog. We will explore how explicitly supporting students in integrating advocacy work into their engineering identity and practice may empower them to become more effective and enduring agents of change and leaders within the field.

Curriculum Development

We have developed a 9-week (one quarter) pilot program, grounded in critical pedagogy, to help students become more effective and enduring advocates. The program will run as a 6-credit special topics course within our university’s engineering department, indicating a weekly average of 2 hours of in-class time and 4 hours of homework. Through the course activities, students will develop a concrete plan for their (new or ongoing) advocacy work, and begin to enact this plan with support from both peers and instructors.

Learning Objectives

We have developed the following Learning Objectives for the initial offering of the course.

By participating, students will:

- **Identify** their individual interests and strengths to integrate advocacy into their practice.
- **Articulate** their scientific and/or engineering identity and how it relates to critical consciousness and their unique potential to shape the world.

- **Develop critical communication** skills via dialog with peers and facilitators (giving and receiving feedback, active listening, collaborative learning).
- **Practice compassionate behaviors** towards oneself and others.
- **Develop and evaluate** a plan for maintaining a balance of both reflection and action for future advocacy efforts.

Guiding Framework

The course is built from a guiding framework for effective and enduring advocacy, which we have defined as the work we do to transform our world's systems and cultures in ways that we believe will make life, love, and liberation more possible. Inspiration for the framework comes from our own experiences, current leaders [9], and past advocates for social change through education [10, 11]. The four steps that make up the framework are:

1. **Find your focus:** We encourage students to let go of perfectionism and overachievement to focus their attention on a single challenge that matters most to them. What problems are most prevalent in your communities? How do your unique experiences give you valuable insights? What issues set your heart ablaze or get your cogs turning?
2. **See your strengths:** We guide students in identifying their unique strengths and how to leverage them for their advocacy, helping to make their efforts more impactful and less prone to burnout. We employ the "Social Change Ecosystem Map" developed by Deepa Iyer, which outlines ten distinct, non- hierarchical, and interconnected roles [9].
3. **Balance reflection and action:** This step emphasizes the importance of maintaining a "praxis" as discussed by Paulo Freire [10]. In this context, reflection promotes learning about all aspects of our focus and our strengths to inform our perspectives and paths forward and assessing our impact. Action is about applying our knowledge, strength, and passion to enact change within our world.
4. **Find joy and love along the way:** Part of what makes it so difficult to sustain advocacy work is that it is impossible to reach a point of satisfaction knowing that there will always be more work to be done. In recognizing that there is not really an end goal to building a better world, we encourage students to find joy in the building itself. Through this course, we promote joy by celebrating personal growth, the connections formed in teams, and in serving our communities and planet.

These four steps are introduced in a workshop during the first meeting of the course and are revisited throughout. They also help to prepare students to complete course assignments, which align with the Learning Outcomes by emphasizing the critical skills of active listening, providing feedback, collaboration, and self-evaluation. The main assignments are discussed in a later section.

Course Outline

The course is briefly outlined in Table 1, which provides topics discussed during each session along with course activities. To model ongoing reflective practice within the program, we will

intentionally co-create some portions of the curriculum directly with students and adjust material dynamically to align with student needs.

Main Assignments

The following deliverables will be completed by students throughout the course:

1. **Midpoint self-reflection:** A vision board, essay, video, or live presentation addressing guiding questions focused on the Learning Objectives for the course, as well as defining the advocacy work (action and reflection) that students propose to undertake for the remainder of the term.
2. **Final live presentation:** Students will share their advocacy actions, progress made, and lessons learned.
3. **Final written reflection:** Students will perform written self-reflection to dig deeper into the more personal aspects of their journeys.

For the midpoint self-reflection and final live presentations, students will be required to engage in peer feedback both with the intention of practicing communication skills around giving and receiving feedback, and to foster a stronger connection between students on individual advocacy journeys.

Program Evaluation

A formative program evaluation with some summative components will be conducted and co-led by an external and internal evaluator. The evaluators will guide us through the development of a program logic model to be tested and further refined during future iterations of the program. The evaluation will explore the role of community and compassion in helping students meet the Learning Objectives, and assess whether the course met its purpose of promoting more effective and enduring advocacy efforts of participants during the course: if so, how, and if not, why? The evaluation will review the implementation of various aspects of the course (assignments, workshops, and co-curricular activities) and consider their contributions to the final outcomes. Given the nature of the course, both cognitive and affective outcomes will be evaluated through questionnaires and interviews with participants. Qualitative data will be used because the sample size of the pilot course is small, but the project may scale in the future and support a mixed methods approach.

Purpose for ASEE

This project provides a framework for integrating critical pedagogy and student-led advocacy directly into an engineering curriculum. We look forward to sharing our motivation and approach to curriculum development within a truly multi-disciplinary team, integrating a range of perspectives on both STEM education and advocacy. Importantly, we also seek feedback from the broader community, embracing the potential to improve, adapt, and collaborate across institutes.

Table 1: Preliminary weekly course outline of activities for each class session. Please note that later weeks are left open to allow for co-creation of course materials with students.

Week	Topic	Detail
1	**Intro: A Guide to Effective & Enduring Advocacy**	- Introduce the guiding framework. - Identify strengths and areas of interest. - Build connections with peers in the course via discussion. - Provide feedback on course outline (first opportunity for co-creation).
2	**How We Conceptualize Advocacy: Frameworks & Scholars**	- Discussion on critical pedagogy as it pertains to the instructors' advocacy framework, both as an example of what they will be asked to do (with a framework of their choice) and to deepen their understanding of the current course's guiding principles. - Opportunity to dive deeper into particular framework(s) of interest and discuss their perspectives with other students.
3	**Focus Group, Workshop on Giving and Receiving Feedback, and Semi-Structured Work Period**	Students rotate between 3 structured activities: - A focus group for initial feedback/evaluation of course proceedings. - A hands-on workshop on giving and receiving feedback, led by our institution's Teaching and Learning Center. - Space for semi-structured and collaborative work on the midpoint reflective assignment, with an instructor available for consultations.
4	**Guest Workshop**	- Workshop hosted by a guest speaker (Magalie René) on the topic of Compassionate Leadership.
5	**Presentation of Midpoint Reflective Assignments**	Students present their Midpoint Reflective Assignments, and receive feedback from their peers and instructors.
6 7 8	**Open-Ended**	Later weeks leave space for optional sessions, co-created with students based on interest. Examples include: - Guest speaker(s) on topics of interest identified by students earlier in the course. - Semi-structured and collaborative work periods to prepare for the final presentation or reflection. - Student-led seminars on topics of interest.
9	**Final Presentations**	Students give final presentations, and receive feedback from their peers and instructors.

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