Board #446: Co-constructing Interventions within a Community College Engineering Program

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1. Introduction

The geographically specific mission and teaching focus of community colleges empowers students from populations that have systemically been excluded from university programs. Community colleges stand apart from other higher education institutions for their role in cultivating a demographically diverse, talented pool of engineering and technology scholars from low-income backgrounds [1], [2]. Engineering associate degree completion by women, Black and Latine/Latinx students is nearing demographic parity [3]. Community colleges have been able to meet the needs of underserved students in engineering education while establishing inclusive practices, and student services that counter the marginalization that students experience in some university settings. Additionally, post-matriculation transfer students persist in engineering university programs at the same rate as non-transfers [4]. Given that Black/African-American, Indigenous, Latine/Latinx and Pacific Islander engineering students who receive an engineering bachelor's degree are more likely to begin their higher education outside of a university [5], it is imperative to devise engineering education systems that include community college transfer pathways into bachelor's degrees. While emerging research into the lives of community college engineering students (in no way an isolated, homogenous population) often compare their achievements to those of non-transfer students, there are few studies that seek to work in partnership with community college students and industry representatives to conduct educational research about community college engineering programs.

2. Focus Group Design

In support of our efforts to evaluate engineering program improvements and to develop a research agenda alongside students and industry representatives, our project's evaluation team designed and implemented a focus group study. Through a process of collaboration, we developed a focus group protocol in alignment with our conceptual model (Figure 1) and two of our evaluation goals:

1) to improve students' workplace-relevant skills in engineering/engineering technology to enter industry jobs; and
2) to develop a pathway for students to earn a certificate or degree, transfer to a 4-year program, and/or enter an industry job.

We solicited voluntary participants in two separate focus groups consisting of current program Students and recent program alumni, and we conducted semi-structured interviews with industry advisors. We invited prospective participants across a diversity of ethnicities, genders, and nationalities through email. All participants were provided with information about the study protocol, and acknowledged their consent and the confidentiality of responses from other focus group participants. The focus groups were conducted by our external evaluator via remote conferencing (e.g. Zoom). Each of the focus groups and interviews were conducted for 30 to 45 minutes. Each of the focus groups were audio recorded, and notes were taken to support data analysis. Audio transcripts from the focus group were coded to support data analysis. Results are reported in aggregate.

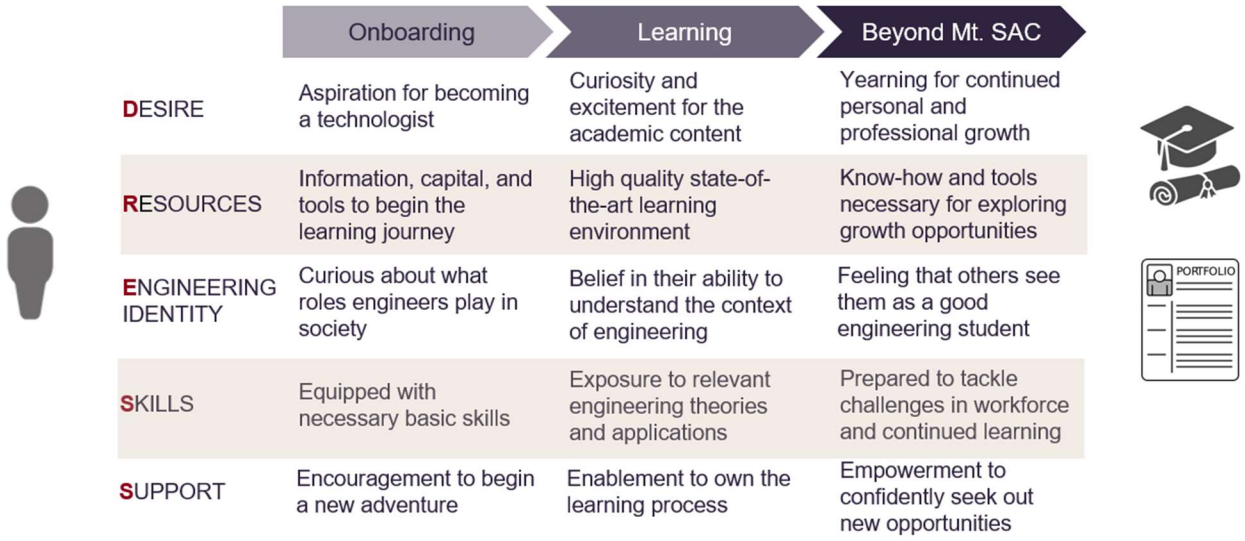

Figure 1: This image provides an overview of the conceptual framework developed to assess the impact of project interventions on program students and their holistic learning experiences.

3. Preliminary Findings

In regards to workplace-relevant skills of program students, focus group participants highlighted various instances in which programming activities provided them with real-world career readiness. In discussing an application of software to workplace duties, one participant said "[their learning in the program] has really helped with using the software that we utilize here in the workplace." Participants emphasized specific examples of improvements, such as their communication with managers, understanding of job duties, team collaboration, problem-solving, and work ethic. Practical applications of engineering in their courses helped them to translate theoretical knowledge into employment opportunities. As stated by one participant, "I feel like I was one of the few people in my internship … that was actually able to take my research in my own direction." Additionally, participants expressed that the program heightened students' confidence in exploring career opportunities in engineering and engineering technology. They identified examples of how the skills students develop in the engineering

program contributed to their efforts in applying to jobs. While participants expressed satisfaction with the learning opportunities and improvements to the engineering program, they simultaneously expressed an interest in additional co-curricular activities, and expanded access to the Mt. SAC Makerspace and additional real-world, project-based learning opportunities.

With regards to the development of educational and career ecosystems for engineering students, most participants discussed the challenge of transferring to a university engineering program while working in the engineering or engineering technology industry. Focus group participants praised the incorporation of guest speakers and visitor presentations within the program. As one participant stated, "[a guest's presentation] really got me thinking what do I really want to do?" Participants expressed that involvement with professionals encourage students to commit to their educational and professional goals. However, several focus group participants expressed concerns about unclear transfer policies within university engineering programs. As one participant stated, "I've heard from friends who have transferred classes that just don't articulate". Experiences of unreceptive transfer environments, systemic neglect, and a lack of policy consistency across university engineer programs (in the University of California and the California State University systems) contribute to the anxiety that engineering students experience as transfer applicants. Additionally, focus group participants noted that the stigma of being a post-traditional student (e.g. older, low-income, part-time, non-White, commuter) impacted students' commitment to their coursework. As one participant expressed "The biggest challenge I am currently facing is as the classes become higher level, more difficult, you definitely need to dedicate more time to them, it makes it a little bit difficult with working full-time".

Overall, feedback from focus group participants was overwhelmingly positive, energetic and constructive. In the words of one participant, "I am Mt. SAC. Ride or die." Industry advisors are satisfied with how recent graduates are "meeting expectations" of the industry in their experiences with recent hires. Participants expressed the emotional dismay of transferring into a less supportive or unreceptive degree program or workplace. Participants also recommended a that Mt. San Antonio College adopt a course schedule with more evening and weekend courses for students who are employed full-time or have additional family commitments.

4. References

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