

Investigating the Impact of a Sociotechnical Approach to Engineering on Female Students



Center for Engineering Education and Outreach



Institute for Research on Learning and Instruction

Piloting a Justice-based Engineering and Data science Initiative (JEDI)

Tufts Springboard

from the Office of the Provost and Office of the Vice Provost for Research (OVPR)

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BACKGROUND

- Engineering degree programs tend to teach technical content without including its social, economic, and political contexts
- Social/technical split identity diminishes students' sense of belonging in engineering & can reduce retention, notably for women and students of color, traditionally underrepresented groups in engineering^{1,2}
- First-year courses make up the initial socialization into engineering culture and can implicitly tell students whether they belong in engineering³

How do sense of belonging and retention rates relate?

Project Goals:

- Integrate data science & social justice
- Promote social justice in engineering
- Increase retention
- Build social justice communities of practice

METHODS

Bringing a Sociotechnical Lens to First-Year Engineering

- Setting: two sections of a first-year introductory engineering course
- Remodeled the course to implement sociotechnical coursework into an introductory engineering course, integrating data science & social justice
- "Equity Learning Assistant" program to help facilitate, plan, & support activities and student thinking
- Data: collected over the course of the semester; using data from pre- & post-surveys and cognitive clinical interviews with students

Did students come to see engineering as more sociotechnical over the course of the semester?

How do these outcomes differ across female students?

RESULTS

Opinions of engineering shifting



"Engineering constantly makes you question your morals and there's much more to engineering than I thought."

"There is a responsibility on the part of any engineer to design ethically and to consider the lasting implications of any new technology"



"Every conversation opened my mind to something I didn't necessarily consider before"

"I think it really hit it on the nail. And it did open my eyes to thinking about engineering more like, broadly and in the sense of like, the people that are actually going to use those products that engineers make."



Not everyone felt the same way...



"There were too many discussions and not enough coding"

CONCLUSIONS

- Students were most interested in topics that they could relate to
- Seeing engineering through a sociotechnical lens causes students to think about the implications of their decisions
- Female students are most inclined to engage with sociotechnical topics, which produces female students with a greater sense of belonging in engineering
- Incorporating sociotechnical topics into other engineering classes could increase retention rates for female students

Selected References

- Malazita & Resetar, 2019
- Foor, Walden, & Trytten, 2007; Tonso, 2007
- Meyers et al., 2012

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