

**(Extended Abstract) Effectiveness, Enjoyment, and Equity: A framework for scaffolding, monitoring, and evaluating teamwork in a capstone engineering design course with industry-sponsored projects**

2022 ASEE Northeast Section Conference

April 22-23

Topic/Track: Inclusive Excellence and Student Success in Engineering Education

Conference website: <https://wit.edu/ASEENE2022>

What do we mean when we say that a team “works well” together? How might we better scaffold teamwork in our engineering design courses? How might we better monitor and evaluate students’ experience on teams?

In the summer of 2020, a team of students and faculty reviewed the capstone engineering design experience course in an ABET-accredited Bachelor of Engineering program at a small R1 university. In this course, students work with the same team of between 4 and 6 students on an industry-sponsored project for six months. Perhaps unsurprisingly, the reviewers believed that students’ perceptions of their experiences in the course was largely determined by their perceptions of their teams. Moreover, evidence of a gender imbalance in team experience was found.

Beginning in the 2021-2022 academic year offering and further updated in the 2021-2022 academic year, the course’s instructional team created a framework for scaffolding, monitoring, and evaluating teamwork. Nicknamed “The 3 E’s,” the framework considered three interrelated domains for teamwork: *Effectiveness*, *Enjoyment*, and *Equity*. The interventions included: new approaches to team formation; new classroom activities; new teamwork assignments; regular individual pulse-checks to monitor each student’s experience on their team and offer targeted additional support; a new Teaching Assistant (TA) program; and analyses to evaluate teamwork in the course.

New methods for team formation included: attempting to avoid isolating women on teams; and development of a cost-minimization algorithm that considered students’ experiences and interests, the likely disciplinary demands of the projects, and compatibility factors. New classroom activities included: a team launch activity using the 3 E’s framework; and a workshop on equity and inclusion in teams with a focus on common manifestations of gender exclusion on teams. New teamwork assignments included: the early development of an articulation of team values and management strategies; and a reflection and revision of that articulation one month later. The individual pulse-checks asked students: to rate their team on a 1-10 scale for effectiveness, enjoyment, and equity; to comment on these ratings; and an option to raise a “red

flag,” which would prompt an instructor to reach out to that student for a confidential check-in. In the new TA program, three students—who had taken the course the prior year—were each assigned a set of teams with which to hold regular check-ins. Methods for evaluating these efforts will include: data analysis of the pulse-checks; and a review of students’ answers to both new and existing course evaluation questions.

These analyses will be completed in March and April, 2022, after this academic year’s version of the course concludes.