GIFTS: Rehearsing Teamwork Challenges in Engineering Design Teams Through Narrative Case-Studies

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This Great Ideas for Teaching Students (GIFTS) details a series of structured case-study reflection activities aimed at engaging first-year engineering students in meaningful discussions and rehearsals of teamwork practices in an introductory engineering course.

Motivation: One objective of the two-semester introductory engineering course sequence at our university is that students learn to effectively collaborate with teammates. While many teams demonstrate effective teamwork, a few teams each year struggle to successfully collaborate. We were thus motivated to enhance the teaching and learning of teamwork skills in the course. Further, ABET accreditation criteria requires students to engage in teamwork [1], and teamwork skills are highly sought after by employers [2], [3]. Teamwork is a common expectation of introductory engineering courses [4], and this GIFT details a strategy for engaging students in thinking deeply about strategies for working effectively in a team.

Students in our class were given many opportunities to practice teamwork skills throughout the year by working in different engineering design teams, but instructors may not have prepared students for dealing with teamwork challenges. Further, the same types of teamwork challenges reappeared year over year. That consistency motivated our research team to do some exploratory research to typify the teamwork challenges that were appearing in our classrooms, which we describe in a separate paper [5]. We then developed narrative cases, inspired by the typical teamwork conflicts that appear in our classroom, to build a teamwork learning activity. Because teamwork skills are highly contextual and are shaped by project-level factors [6], using cases that are inspired by the specific contexts and projects that our students are experiencing makes them highly relevant. Discussing relevant teamwork challenges as a team provides a low-stakes way for students to practice teamwork behaviors.

Objectives: The objectives of our teamwork learning activity are that students rehearse reactions to team conflict in a low-stakes rehearsal, build empathy for each other and for their peers more broadly, and strengthen camaraderie amongst team members in a low-stakes environment. Primarily, we want students to think through various types of team conflict and to consider how they would react and what resources are available to them. The teamwork learning activity is an opportunity for students to rehearse team conflict so that if they experience a similar conflict in real-life, they feel equipped to meet the challenge because they have previously thought it through. Rehearsal has been used previously to help students learn and practice skills (e.g., [7], [8]), and we've adapted this strategy to a teamwork context. Additionally, we want students to begin to build empathy for teammates or other students whose actions might initially make them feel angry or frustrated through exploring teamwork conflict from the perspective of multiple people on a team. Finally, we want to strengthen the camaraderie amongst members of the design teams in our classes through asking students to share their personal prior experiences of teamwork and rehearse team conflict within their engineering design teams.

We designed narrative cases based on teamwork challenges that were prevalent in our courses. Each case of teamwork conflict is described from the perspective of multiple team members on a team. We drew inspiration from student reflections on teamwork whenever possible, de-identifying the scenario entirely while trying to remain authentic to the students' self-reported thoughts and feelings, even including quotes or student language from reflections when possible. Next, we developed a set of reflection questions to accompany the scenarios. Instructors implemented the activity for the first fifteen minutes of class time three times throughout the 2025-2026 school year.

Practical Implementation Details: Two instructors introduced three different teamwork case studies across 6 class sections of an introductory engineering course. There were approximately 37 students in each class section, and students worked in teams of 4 or 5. In the classroom, we first introduce the perspective of one student who is, generally, a frustrated individual who feels like one or more of their other teammates is holding the team back from success (Table 1, Student 1 perspective). Students then discuss a series of reflective questions in their engineering design teams before sharing some of their responses in whole-class discussion (Table 1, Reflective Questions 1).

We then present the same scenario from the perspective of another student (Table 1, Student 2 perspective). This is generally the perspective of the student(s) who were perceived to be problematic in the first perspective. This second perspective contradicts or complicates students' understanding of the first perspective. We again have students discuss new reflective questions in their teams and share out in whole class discussion (Table 1, Reflective Questions 2). Finally, we end the activity by asking the students to connect the case study to their own past experiences with teams and reflect with their group (Table 1, Connection Questions).

Anecdotally, when we presented this example scenario (Table 1) in the classroom, we noticed that students responded to the student 1 perspective somewhat harshly. Students frequently agreed with the frustrated student and expressed that they were angry with Kai and that Kai was not a good teammate. But when the additional context was provided, students began to soften their responses, demonstrate empathy with Kai, and realize that their initial reactions to the situation were one-sided. Conversations about how to approach this difficult teamwork situation helped student teams begin to discuss what they wanted their own team to look like, as they were able to say "we would not want to call someone out in the group chat, we would instead talk to the teammate one on one," or "we would try and talk to the teammate first instead of escalating to the professor."

This activity also provided an opportunity to remind students of resources available to them if they find themselves in need and to reinforce to students that these resources should be viewed as a regular part of the college experience and not as a last resort. At our university, this included tutoring resources, academic coaching, disability access services, and counseling services.

Table 1. Example Case-Study Reflection Prompts

Topic	**Example Text**
Student 1 Perspective	• Jordan feels as though they contribute their fair share to the project. • Jordan expresses frustration with their teammate Kai, who Jordan claims is a "non-contributing member of the team." • Jordan is frustrated with Kai's continual absences for reasons that are "easily disproven" and their constant lack of communication. • Jordan also believes that Kai doesn't desire to have a role in the group, and that they don't contribute to any tasks.
Reflective Questions 1	• If you were in Jordan's shoes, how would you react? • How should you NOT respond? • What are some possible reasons for Kai's behavior?
Student 2 Perspective	• Kai feels unhappy with their own performance during the semester. • Kai was sick and had to be absent frequently, so they felt unable to catch up to the rest of the group. • Kai tried to do their part by working on the final report, but did so very close to the deadline and felt like there was not much left to add.
Reflective Questions 2	• With this new perspective, would you change how you respond to Kai's behavior? • If you were in Kai's shoes, how would you act? • What could Kai do to be a better teammate, and what resources are available to Kai?
Connection Questions	• Have you ever experienced this kind of conflict? • What did you do? What do you wish you had done differently? • What context were you missing? • How did that situation make you feel? • What resources did you use? What additional resources could you have used? • What advice would you give to someone else in this position?

Assessment Methods: We do not have Institutional Review Board permission to share student data on the outcome of this implementation, so we share what evidence we can from the instructor perspective. We did not require students to complete any assignments during the activity because we wanted them to be focused on engaging in conversation with their teammates. Instead, there are three separate ways that we assess teamwork in the course more broadly that demonstrated students' understanding of and engagement in the teamwork learning activity.

First, after the first case study was introduced in class, each engineering design team created a "Culture Contract" which documented their team goals and behavioral expectations. They created a culture contract again midway through the semester for their second engineering design project. The culture contracts gave instructors insights into the ways that students were preparing

their team to minimize potential conflicts and to know how to behave if those conflicts arose, as well as set expectations within the student teams. Second, after each design project (and at mid-points for longer projects) we gave students a written reflection assignment that asked specifically about teamwork experiences. This allowed instructors to gain insight into what was going well on teams and why teams might be struggling. Finally, we had students evaluate their own teamwork and the teamwork of each member of the team using the CATME peer evaluation tool [9]. Answers to the written reflection questions and the CATME survey provided insights into what was happening in the team, challenges that arose, and the conflict resolution behaviors that were being used.

Throughout the semester in which we introduced these case studies to student teams, instructors noticed, anecdotally, that there was generally less conflict on teams and that students were more proactive in communicating about expectations. This reduction in team conflict was reflected in the detailed and specific culture contracts that reflected the potential issues students were exposed to in the case studies. Additionally, as compared to the course last year with no teamwork case studies, students shared generally more positive sentiments about working on teams in the written reflections and CATME scores were higher. This anecdotally indicates that teamwork case studies may be helping students build teamwork skills.

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