

BOARD # 321: An Investigation of Team Conflicts Among First-Year Engineering Students (Year One of NSF PFE: RIEF)

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Study Context

Team-based design projects are an essential element of an undergraduate engineering curriculum. Many students in engineering programs are assigned their first long-term team-based design project in the context of interdisciplinary introductory engineering courses during their first semester on campus. Interpersonal conflict with teammates is a common challenge for students [1]. Responding to team conflict promptly is a logistical challenge when the student-to-instructor ratio is high, as is often the case with large-enrollment introductory engineering courses.

The study context is a required first-semester Introduction to Engineering course taken by approximately 650 students every fall semester at the University of Delaware, a large public R1 university. The course is structured around a summative team-based design project with periodic deliverables interspersed through the semester and a final project report due at the end of the semester. Students work on this project in teams of 4-5 and complete self- and peer-evaluations using Comprehensive Assessment of Team Member Effectiveness (CATME) peer evaluation surveys. CATME is a validated peer evaluation system that is widely used in engineering programs to collect quantitative information to individuate student performance [2]. The lead instructor (PI of this project and first author) uses 28 undergraduate teaching assistants to provide additional instructional support [3]. Because the teaching assistants are engineering undergraduates who have previously completed the course, they serve as near-peer mentors (NPMs) for students in the course.

This NSF PFE: RIEF project aims to identify the root causes of student team conflicts and explore how NPMs respond to reports of student team members not contributing as expected. With this, we seek to develop a defensible logic model for a coaching program for NPMs that promotes equity-oriented strategies for identifying and responding to conflicts that arise during team-based design projects. This paper presents preliminary results from two different survey instruments—Student Team Reflection Survey and Mentor Observation Survey—developed to collect confidential reflections on team conflict in the introductory engineering course at the end of the semester. Insights into the nature of team conflicts from these two different perspectives are presented. The study and survey instruments have been approved by the institution's Internal Review Board.

Survey Instruments

The Student Team Reflection Survey (STRS) collects data from students regarding their experiences with the incidence and severity of conflict within their team during the semester. This survey also asks if and how the students reported concerns with team conflicts during the semester and how they sought conflict resolution. The survey contains a mixture of multiple-choice, Likert scale, and open-response questions. The Student Team Reflection Survey was distributed via Qualtrics to all students in the Fall 2024 semester of the course on the last day of class after the final project report for the semester project was due. Each student was asked to complete the survey once to reflect on their team experience during the entire semester. Of the

695 students enrolled in the course, 453 students completed the survey and consented to participate in the study (65% response rate).

The Mentor Observation Survey (MOS) collects data from the NPMs to capture their impressions of team conflicts within the teams that they mentored. This survey includes questions about how the NPM noticed incidences of team conflict and how they responded to it. The survey contains a mixture of multiple-choice and open-response questions. The Mentor Observation Survey was distributed via Qualtrics to all 28 NPMs for the Fall 2024 semester at the end of the semester after all student teams had submitted their final project report. The NPMs were asked to complete the survey once for every team that they mentored. We received MOS responses for 84 teams out of 144 teams (58% response rate) from 19 NPMs who consented to participate in the study.

Preliminary Results from Survey Instruments

Severity of team conflicts: The students and NPMs were both asked to rate the severity of team conflict on a scale of 0 to 10 (10 being most severe) at its worst point during the semester and at the time the final project report was submitted at the end of the semester. As seen in Figure 1, responses from both the STRS and MOS surveys indicated an overall lessening of the severity of team conflict by the time the final project report was submitted as compared with any conflict at its worst point during the semester. Over half of the responses in both surveys indicated low conflict at the final project report submission time (severity rating 0-2). A higher incidence of severe conflict is reported in the STRS results than MOS—22% of STRS responses and 11% of MOS responses report a conflict with a severity ≥ 6 at the end of the semester.

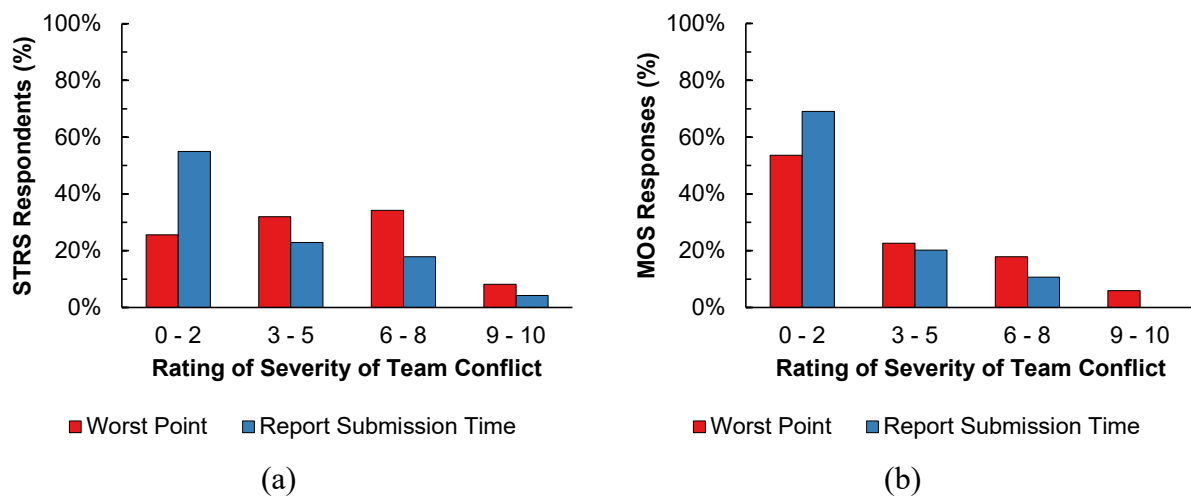


Figure 1. Severity of team conflict reported on a scale of 0 – trivial concern to 10 – major conflict, at its worst and at the time the final project report was submitted, based on responses to (a) Student Team Reflection Survey and (b) Mentor Observation Survey.

Sources of team conflicts: Students and NPMs were both asked to select the primary source(s) of team conflict. Top sources of team conflicts from both the surveys included someone not contributing as much as they were capable of (58% of STRS responses, 39% of MOS responses), someone losing interest in the course (29% of STRS responses, 37% of MOS responses), and team struggling to find times/places to accommodate all teammates' needs (34% of STRS

responses, 10% of MOS responses). Figure 2 shows the primary source(s) of conflict reported in the STRS and MOS surveys; respondents could choose more than one option.

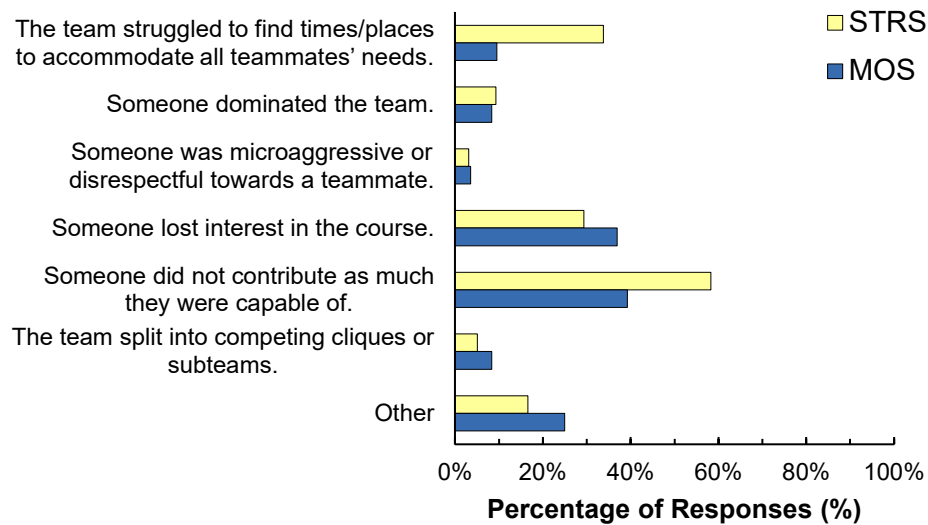


Figure 2. Primary source(s) of team conflict indicated in the Student Team Reflection Survey (STRS) and Mentor Observation Survey (MOS).

Reporting team conflicts: In the STRS, students were asked if and how they reported any team conflicts. 83% of STRS responses indicated that they did not report a concern or conflict to the instructor or NPM. Additionally, 46% of STRS responses indicated that they did not report the team conflict via CATME peer evaluation surveys. Figure 3 shows the results from STRS on how students reported team conflicts.

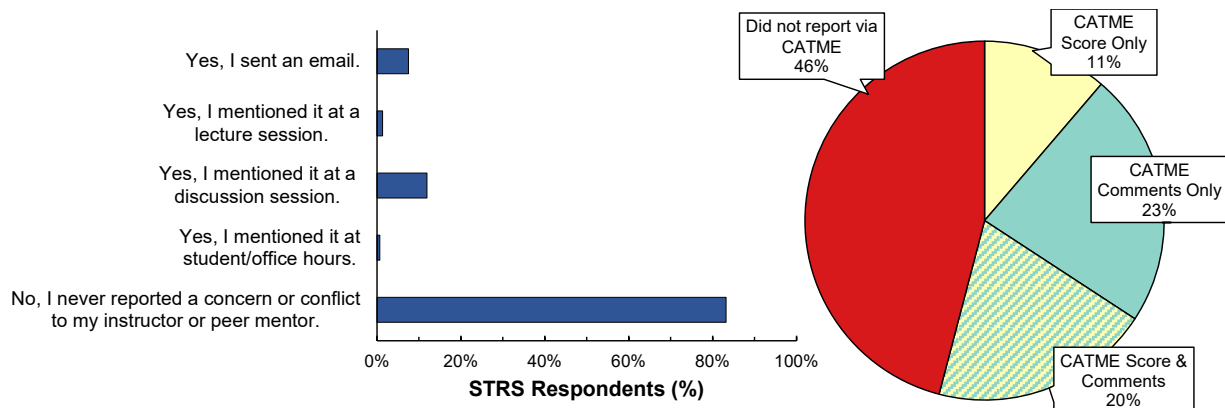


Figure 3. Reporting of team conflicts to instructor/NPM and via CATME in the STRS.

In the MOS, the NPMs were asked if they recall noticing any CATME ratings, flags, or comments that indicated a conflict within a team. Around 35% of the MOS responses were “yes” to both the questions, “When you reviewed CATME scores did you ever notice any ratings or flags that might suggest team conflict within this team” and “When you reviewed CATME comments, did you ever notice any ratings or flags that might suggest team conflict within this team”. The remaining 65% of the responses to these questions were “I do not recall”.

Resolution of team conflicts: Finally, the STRS and MOS both contained a question that asked if the team’s conflicts were satisfactorily resolved by the time the final project report was submitted at the end of the semester. In both surveys, around 75% of the responses answered “yes” to this question. Figure 5 shows the distribution of survey results for this question from both surveys.

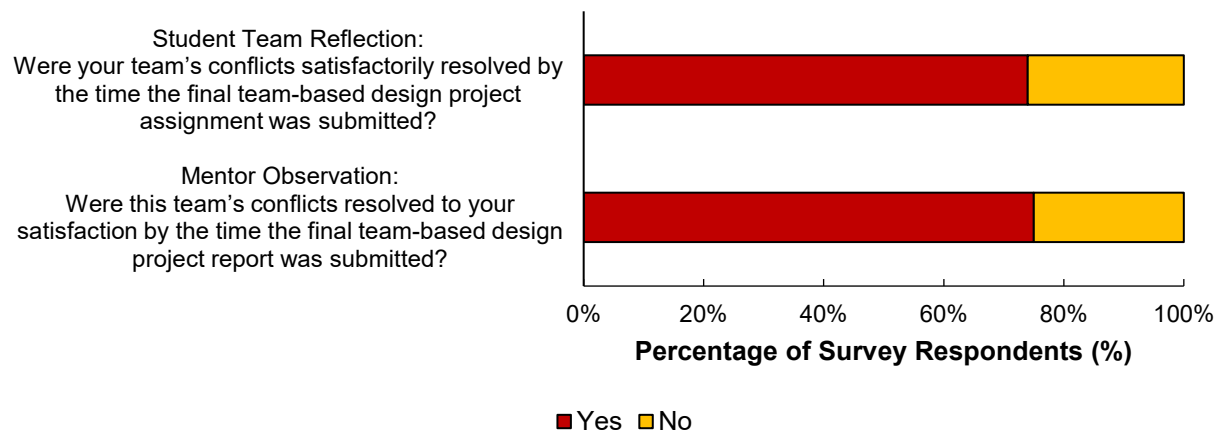


Figure 4. Satisfaction with team conflict resolution at the end of the semester as reported by students in the Student Team Reflection Survey and as observed by NPMs in the Mentor Observation Survey.

Conclusions and Future Work

This short paper presents preliminary quantitative results from two different survey instruments that gathered data on student team conflicts in a first-year introduction engineering course from the student and near-peer mentor perspectives. While there are reports of student team conflicts in the survey data, results show that most of student teams in the Fall 2024 semester of the course have little to no remaining conflicts by end of the semester. Our next step is to do a more detailed analysis of both survey results by including the qualitative data from open-ended questions. We will additionally be analyzing the CATME scores and comments submitted by the teams during the semester. Both surveys will be distributed again in Fall 2025; this will enable us to compare the datasets from both the semesters. We plan to triangulate team conflict data using the STRS, MOS, and CATME data.

This work is a part of the first phase of this NSF PFE: RIEF project focused on the research question, “What are the root causes and common characteristics of engagement-related team conflicts in introductory engineering courses?”. Two additional phases, which will be completed in year two, are focused on understanding how NPMs facilitate discussions with student avatars experiencing conflict in a mixed-reality simulation and identifying essential features of a coaching program for NPMs to improve their efficacy in responding to reports of team conflict.

Acknowledgements

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References

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