



## WIP: Challenges with Teaming Instruction and Managing Dysfunction

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# **ERM-WIP: Challenges with Teaming Instruction and Managing Dysfunction**

## **Introduction**

This is a Work-in-Progress paper. Teaming continues to be an important dimension of engineering work and by extension a required outcome of engineering education. Despite the emphasis and importance ABET places on teaming and the efforts of institutions to meet these requirements [1], students may or may not develop effective team behaviors as a result of the various team experiences they have in an engineering curriculum. Researchers have noted that these skills have traditionally been considered “outside of the curriculum” and the instruction of these skills has been primarily relegated to cornerstone and capstone design courses. Even in these courses, formal instruction on teamwork may be limited.

As part of a curriculum improvement process within the Mechanical Engineering department at Rose-Hulman Institute of Technology, we are working to coordinate “threads” that cut across courses in the curriculum, e.g., student teaming, technical communication, business acumen, ethics, and ill-structured problems. Each active thread is championed by a small faculty committee, charged with prompting and analyzing department reflections, moderating and documenting departmental discussions of results, and collecting and sharing evidence-based practices relevant to the thread. Each thread is following coordinated change processes across dimensions presented by Borrego and Henderson [2] in order to have a greater potential effect. For more detail on specific change activities, please see Sangelkar, Mertz, Bernal, & Cunningham [3].

This present work focuses on a specific step in our change process for the student teaming thread--a case study of instructors’ experiences with teaming instruction and managing student team dysfunction at our institution. A later step will involve capturing student experiences with teaming instruction and dysfunction. In earlier survey work we found significant variation in teaming instruction and how team dysfunction is managed. To clarify these practices and the challenges faculty members experience with them, we are conducting individual interviews with Mechanical Engineering faculty who teach named required courses that involve teams. We define teams as pairs of students and groups of 3 or more students. Through this case study we aim to examine the specific teaming practices and challenges associated with student teaming at our institution in the context of theoretical teaming practices. For this examination, our research questions are:

1. How do frameworks for teaming instruction vary across the Mechanical Engineering curriculum and within individual courses at Rose-Hulman Institute of Technology?
2. How do Mechanical Engineering faculty at Rose-Hulman Institute of Technology describe the challenges they face in regard to instructing students on effective teaming?

3. How do frameworks for managing team dysfunction vary across the Mechanical Engineering curriculum and within individual courses at Rose-Hulman Institute of Technology?
4. How do Mechanical Engineering faculty at Rose-Hulman Institute of Technology describe the challenges they face in regard to managing student team dysfunction?

## **Background**

### *Teaming instruction frameworks*

Team instruction is sparsely explored by the research community, but some guidance exists. Oakley et.al recommends facilitating the team policies and team expectations agreement early in the term to set clear guidelines for team functioning and then following up with best suggested teaming practices [4]. They also recommend exposing students to the “coaching with hitchhikers and couch potatoes guide” early in the term and having students reflect on their teaming experiences. CATME, a tool for conducting formal peer assessment, uses a behaviorally anchored rating system which can also be used as a teaching tool. CATME provides students actionable feedback on how they are doing and what they can do to improve [5].

### *Common team dysfunctions*

A teaming dysfunction is any attitude or behavior which prevents a team from entering, or forces a team to leave, the performing stage of team dynamics [6]. Such dysfunction inhibits a team from meeting its stated objectives. Dysfunction is different from conflict as conflict can have a positive or negative impact on team performance [7, 8]. Various teaming effectiveness models exist, which have many overlapping traits such as establishing common goals or purpose, having a sense of trust, and having a diverse set of skills [9-11]. A breakdown of these elements inevitably leads to team dysfunction.

Common causes of team dysfunctions found in literature include detrimental attitudes or negative emotions [12], traits of problematic team members [13], team dynamics issues [14], and power dynamics, manifested when resources become scarce [15]. The most commonly reported dysfunction in literature is the “hitchhiker or couch potato” [16]. The instructor plays an important role in helping student teams manage or possibly avoid dysfunction by controlling some of the external factors that affect teaming success [17] and mentoring students through conflicts that can lead to dysfunction [16].

### *Frameworks for managing team dysfunction*

There are four primary approaches for managing team dysfunction, including: (1) lecturing about ways to manage interpersonal conflict, (2) workshops where the team discusses their purpose/goals or working through case studies, (3) simulation training in an environment that mimics future tasks, and (4) incorporating team reviews which allows teams to monitor their quality of teamwork. Out of these four approaches, the least effective is lecturing [18].

Within the approaches of dealing with team dysfunction, we can further categorize the methods as either proactive or reactive. Proactive methods include intentional guidance when forming teams [19, 20], encouraging good teaming practices such as developing team contracts/charters [16], providing “Frame of Reference” training [21] on how teamwork will be assessed, training on psychological safety [22], among others. Reactive approaches include peer evaluation coupled with other training or intervention [20, 23], mediation meetings, often with instructor guidance on active listening skills or other arbitration techniques [24], hiring/firing procedures being implemented [16], or mandatory reviews of team contracts.

## **Qualitative Research Methods**

This is an exploratory multi-case study designed in accordance with recommendations by Yin [25] to document the teaming instructional practices and management of teaming dysfunction employed in the Mechanical Engineering curriculum at Rose-Hulman Institute of Technology. The named required courses of the Mechanical Engineering curriculum form the overarching case with sub-cases for examining each individual named required course. This enables illumination of the teaming practices across the curriculum with fidelity to see variations within individual courses as well.

Data is being collected through semi-structured faculty interviews asking about their instructional practices, management of teaming dysfunction, and the challenges they describe doing these things. See the protocol included in the Appendix. All departmental faculty are being invited to participate (~25 individuals) and we anticipate 15-20 participants, which will cover each included course with at least three instructors. For this WIP preliminary findings, three interviews covering the year-long capstone design sequence are presented. However, the planned methodology for the full study is described here. The study has been approved by institutional IRB with appropriate consent and reporting procedures. Individual participants are not identified and data is only presented in context of the entire curriculum or within a course where there are at least three faculty represented.

Data is being analyzed in aggregate across the curriculum for each interview question and will later be split out at the course level for examining trends and developing interpretations. For this purpose, each interview is summarized, meaning individual statements are parsed for each question. Statements that are incoherent or not related to their own practice of teaming instruction or managing team dysfunction are removed at this stage, e.g., comments on another instructor’s practice. However, if another instructor is referenced as a model for their own practice, it will be included. Each statement is also labelled with a course id and non-identifiable participant code.

For coding, statements are randomized and these labels are hidden to reduce bias. Statements are open-coded in an iterative process. One member of the research team will initially code all of the data and develop the descriptive codes. In a secondary process other members of the team will

code subsets of the data and disagreements will be discussed and mutually agreed upon and the codebook will be refined. Then an individual outside of the research team will code statements using the refined codebook as a check of inter-rater reliability. Disagreements will be resolved mutually and the codebook will be refined. This will be iterated until at least 80% agreement is achieved. After this the data will be analyzed for themes across the curriculum and within individual courses.

## **Preliminary Results**

The preliminary results of three interviews with faculty members who teach the year-long capstone design sequence are presented in this section. The results below represent a sample of the kind of insights we will be looking for once all the interviews have been conducted. The capstone design course was chosen as the first course of interest because teaming is used by every instructor of the course and each one uses different levels of teaming instruction. We were trying to vet our process to obtain the needed clarifications on teaming instruction, the types of dysfunction faculty commonly observe, and their methods of managing dysfunctional teams.

The results from interviews with capstone instructors regarding teaching teaming instruction seemed to suggest that there was little explicit instruction as most felt the students should have been adequately prepared in previous classes. One faculty member commented, “I do not formally present teaming methods in the courses that I teach. I expect by time they get to their senior year that they have enough exposure to teaming methods that they can hit the ground running.” This appeared to be a general consensus with very minimal instruction at best.

In terms of challenges they experienced in teaching teaming, all were not very versed from literature regarding frameworks. Most used either past experiences or information provided by their previous mentors to help inform how they currently instruct students. Some were unsure of “good” assignments to help teach teaming where others focused primarily on project management in terms of agendas rather than teaching team instruction early during team formation.

All faculty teaching design-based courses are able to identify with common dysfunctions reported in literature but the way in which they managed dysfunction was not informed by the frameworks found in literature. Faculty typically used their past experience and past role models as a guide for how to handle intervention. Faculty tended to use peer evaluation to monitor team effectiveness. In addition, one faculty member also used student self-reported time-logs to identify and proactively mitigate teaming issues. In general, instructors typically use a partnership approach - the instructor helps the team handle issues instead of demanding what they should do. The instructors indicated that they approach the mediation differently depending on the severity and urgency of the dysfunction observed. Some instructors rely heavily on student initiation of intervention. The typical types of dysfunction encountered seemed to be primarily based on the lack of equal contribution.

Multiple faculty expressed that they were somewhat uncomfortable or ill-prepared for dealing with dysfunction caused by cultural differences. One faculty member did explain how they brought in other faculty who had experience with the two different cultures to help with a team that was experiencing this kind of dysfunction. Some instructors noted that they felt like they needed more training to help them manage teams more effectively.

## **Discussion**

It should first be noted that with our limited data we cannot yet make definitive conclusions about the extent of teaming instruction across the curriculum, however, this exercise has revealed a few important observations related to teaming in the capstone courses. First, the instructors of the capstone courses largely agreed that by the time they have gotten to their senior year, they should have had significant teaming experiences that would prepare them to behave effectively in teams. An initial survey that was conducted earlier showed that teaming instruction varied quite a bit between instructors of a given course and thus the students may not be getting the teaming instruction that the capstone instructors are assuming [3]. Our future interviews will attempt to reveal the extent to which this might be true.

Second, familiarity with literature on team instruction and managing team dysfunction is limited. A key expressed need is help with distilling best practices from literature into practical help that an instructor can implement in their classes. There was desire expressed in the interviews for such resources. Most of the current strategies revolved around experience and emulating exemplars that they have worked with, but little has been done to share these practices between faculty. By bringing this to light, we could leverage the change models being employed to build such transfer of expertise within the department.

Finally, it is important to recognize that the personal management and teaching style of each faculty member plays an important role in strategies that are used to help students improve their teamwork skills. It can be valuable for students to see these different styles. Our change strategy should value these different perspectives while building a shared vision about what the common outcomes should be and coherence across the varied experiences. It seems like there is currently a lack of clarity around the current learning objectives for teaming. Future work will be dedicated to completing the interviews and analysis. After that, the results will be disseminated in order to build a shared vision within the department regarding learning objectives for teaming and scaffolding instruction to achieve the desired goals.

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## **Appendix - Faculty Interview Protocol**

We used a semi-structured interview protocol centered around questions directly addressing the research questions.

Q1. Do you provide formal instruction to students on teaming in [specified course]?

*If yes...*

What formal instruction do you provide? If this instruction is based on a particular framework(s) what is it (are they)? If you use a particular tool(s) what is it (are they)?

Do you experience any challenges that affect the formal teaming instruction you provide? If so, what are these challenges?

*If no...*

Do you experience any challenges that prevent/inhibit you providing formal teaming instruction to students?

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Q2. What is the most prevalent student team dysfunction you observe in [specified course]?



[Open question initially, follow-up with list of dysfunctions compiled from literature.]

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Q3. How do you handle student team dysfunction in general when it occurs in [specified course]?

[Options: Hands-off / Proactive / Partnership / Instructor Prescribed]

Do you handle specific dysfunctions differently than this general approach? If so, how?

If your process for handling student team dysfunction based on a particular framework(s), what is it (are they)? If you use a particular tool(s) what is it (are they)?

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Q4. Do you experience any challenges that affect how you handle student team dysfunction? If so, what are these challenges?