

Working effectively with your teaching team: Tips and Tricks from Laboratory and Design Course Instructors

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Introduction

Effective implementation of college classes, particularly at larger institutions, relies on the support of teaching teams. Members of these teaching teams can represent a wide range of career stages, teaching experience, technical knowledge, and motivation. In courses that utilize teaching teams the role of the instructor goes beyond teaching and course administration to include leadership and management – skills that may not be part of an instructor’s previous academic training. This paper provides context and advice that aims to help new engineering educators as they learn to manage their teaching teams.

Effective team management is an important ingredient for the overall success of a course and to the experience of individual students. Even in cases where the course design represents best practices in teaching, including practices we have discussed in a previous tips and tricks paper [1], it is impossible to make a course invariable under multiple instructors. Each member of the teaching team will bring in their own pedagogical content knowledge [2], [3], beliefs about effective teaching [4], [5], and personality into the way they do their job. We value the growth of teaching team members as educators, yet we also acknowledge the effects that the different choices of individual team members can have on a course and its students. For example, research has found that graduate student teaching assistants have significant impact on course climate, grades, and retention in STEM courses [6].

In this paper we focus on the context of teaching teams in lab and design-focused STEM courses at large research-focused universities with PhD-granting programs that do not include required Teaching Assistant (TA) training programs or have limited training requirements. These institutions utilize TAs as members of their teaching teams to support undergraduate students in their programs and sometimes as part of graduate program requirements. Some courses may also utilize other models that include undergraduate students in teaching or related support positions. Including graduate and undergraduate students in instruction provides a dual benefit: to allow larger classes to function, and to support the professional development of those students as future teachers or faculty through a cognitive apprenticeship model [7], [8], [9], [10].

Leading teaching teams that include graduate and undergraduate students can be challenging because of the diversity of experience and the relative transience of the population. A teaching team can easily include a range from true teaching novices with no experience leading a classroom, to TAs who have taught the course for several semesters, to experienced TAs who are new to a particular course. We value providing professional development to all members of the team, particularly in learning effective pedagogical practices; however, learning how to teach is highly situated and develops over a long time with experience [11]. Readers who are interested in long-term development of their teaching teams’ pedagogical knowledge should consider teacher training resources [12], [13], [14], [15], [16] and pedagogy course curricula [17], [18], [19], [20], [21], [22]. In the short term, however, it is crucial to ensure that all members of the team – even our developing novices – are able to teach at a level that provides an acceptable experience to students in the classroom.

Ultimately, there are certain components of leading a teaching team that must be carried out clearly and consistently for a course to function well. The person in the leadership position holds authority as a leader to oversee their team and holds responsibility for the outcomes of their team's work. Preparing a team to teach at a practical, day-to-day level includes clarifying job descriptions, establishing expectations and boundaries, developing functional knowledge of course materials, and aligning team members to the vision and values of the course. These components do not occur at the expense of the teaching team's professional development; indeed, recommendations for effective graduate TA training suggest that professional development should be interwoven with the practicalities of operating a course [23].

This paper is developed to support early engineering educators by pooling the experience of various instructors who lead teaching teams, particularly in lab and design courses. These lab and design courses can present a particular challenge for team instruction because of the various domains of specialized knowledge that must be developed to teach effectively. The authors, who are members of a Community of Practice for lab and design course instructors [24], offer anecdotes and advice for addressing practical challenges that we have identified as shared themes across our instruction, including understanding who is on your teaching team, establishing and aligning expectations, calibrating feedback and grading, and navigating dissent and disagreement with team members. We hope that this serves as a useful guide that complements the professional development of new engineering educators as they encounter and navigate their own challenges around leading their teaching teams.

Knowing your Teaching Team

Hiring vs Assigned TAs

TAs can be a limited resource, and each department has a task of matching TAs to courses. Specialized (small, upper-level) courses that require TAs with those same specialized technical skills may have a smaller pool of qualified TA candidates to select from. Most courses would also prefer TAs with strong "soft skills," particularly in communication and organization. While these skills can be built up over time, that is a time-consuming commitment. Furthermore, identifying which TAs have these soft skills or will be amenable to developing them often comes from personal interactions. It is likely that a lower-level undergraduate course that serves many students and requires a large staff of TAs will also absorb many TAs who's technical and/or soft skills are yet to be developed.

Instructors are also presented with different levels of input into the hiring process. While some are able to directly choose their TAs from an applicant pool or select a student from their own research group, others are at the mercy of their appointed TA coordinator and lack any direct input into the process. In the latter case, potential TAs may not be matched up as ideally, and as mentioned above, will require additional training to make a smooth transition into a teaching role.

Undergraduate Staff

In institutions without large graduate student populations, undergraduate teaching staff may be required for lab or design support. Even at universities with large graduate student populations, undergraduate teaching staff can be a viable alternative to graduate student support and/or offer supportive services to offset the various tasks related to the teaching-and-learning environment.

Often, these are more senior students that have taken the class previously, so have some technical content knowledge. However, these students often lack teaching experience and are less familiar with being on the other side of the desk, so to speak. They sympathize well with students but will make mistakes regarding best practices in teaching and learning. Additional support in both classroom management and appropriate learning pedagogy may be required. However, undergraduate assistants can be a powerful near-peer resource when properly supported. When such support is present, such as in the Learning Assistant program [25], which explicitly includes components of practice, preparation, and building understanding of pedagogy, near-peer instruction can improve attitudes and retention of students in the classroom while offering benefits to the undergraduate teaching staff as well [26].

Motivations and Pressures

It is also important to recognize that teaching assistants can have many motivations for their service and will therefore approach the position with varying levels of interest and involvement. For some, it is simply a means of obtaining funding for the semester. Their department may require it for graduation, or their research advisor may not be able to support them on a research grant. For these teaching-staff members, there may be less interest and buy-in for the teaching and learning aspects; they simply want to know and perform what is necessary to complete their teaching obligations. Here, it is especially important to engage in team-building exercises that emphasize student empathy and the direct effects of their role on the education of the student population. On the opposite end of the spectrum, some teaching assistants will be pursuing faculty positions after graduation and will therefore treat the opportunity as important training for their future positions. These students may be more interested in pedagogical training and classroom management skills than their peers and may even seek additional opportunities to practice these skills during the semester. The team building exercises should include explicit references to best practices in teaching pedagogy.

Likewise, undergraduate teaching staff also approach the position with multiple motivations. For some, it is the desire to help their fellow students facing the same challenges that they recently encountered. For others, the lure of a paycheck is also a strong motivating factor. Finally, others may be considering graduate school and recognize that teaching experience can be both important training and an impressive item on their resume to set them apart from others of their cohort. Since many undergrad teaching assistants actively seek out the position, they may approach the opportunity with more enthusiasm than some of the graduate teaching assistants. Never underestimate the value of “hiring young” when a strong-performing student also displays the enthusiasm to assist in the education of their peers. A great experience for these hires can result in a knowledgeable and reliable resource to your course for multiple semesters.

It is also critical to note that teaching staff are also facing additional pressures that may impact their performance and commitment. Both graduate and undergraduate staff may be taking classes on top of teaching or attempting to balance their research responsibilities with their teaching duties. Having realistic expectations and clear communication between staff members is essential to ensure the course runs as smoothly as possible.

As the instructor for the course, it is important to recognize this spectrum of motivations since it ultimately impacts how you as the instructor interact with them, the resources they may be seeking, and the level of involvement that can be expected. In short, knowing what motivates

your staff can help you set realistic goals and offer appropriate support and development opportunities to your staff.

Aligning Expectations

Job Description and Calibration

As the staff have a prominent role in delivering the lab course, it is important for all members, regardless of experience level, to understand the requirements and expectations of the job. Instructors, TAs, and undergraduate staff or course aides must work as a team and therefore should meet regularly to calibrate these expectations. The instructor may have certain assumptions from having taught the course multiple times prior, and the returning TAs may overlook certain details when conversing with or training new staff. If the undergraduate staff have previously taken the lab course, they likely did not understand the full extent of the staff responsibilities “behind the scenes” before beginning this role.

Before recruiting or hiring staff, the instructor will likely hold an interview (formal or informal, in-person or virtual, after the application process) in which the staff roles (including time commitment, weekly responsibilities, etc.) are made clear. Expectations such as preparation, timeliness, and grading policies should also be discussed. The prospective staff should have the opportunity to ask questions and tour the lab space.

If the staff is *assigned to* rather than *hired by* the instructor, the same process may occur in an onboarding meeting. In any case, after the lab course staff has been determined, the instructor may choose to hold such a meeting during the week(s) before the course begins (depending on when the staff are cleared to begin working) to sign contracts and discuss expectations, course structure, logistics, resources, lab space, materials, and upcoming experiments in more detail. It is a good idea to have these topics documented in a written manual or guide that can be distributed or shared as a reference to be used throughout the semester; deciding on a data storage system for lab materials, assignments, answer keys, and graded work can aid in this effort as well. Keeping a written checklist can be helpful when instructors set up the course staff in subsequent semesters. Furthermore, allowing the staff an informal space to get to know each other and share contact information is valuable for developing a sense of teamwork and camaraderie.

Cultivating a highly functional team appears to be a challenge for most course instructors, especially as the size of that team grows. Thankfully, there are many resources dedicated to this, including one of our favorites, *The Five Dysfunctions of a Team: A Leadership Fable* by Lencioni [27]. A good read for anyone, any instructor is likely to extract features of team dynamics from this text relevant to both the most-evident dysfunctions of their own team as well as most applicable to that team leader’s own deficiencies. For one course in our Community of Practice, the instructor has found it valuable to focus on building trust by spending time learning a little about each teammate’s background as well as their strengths and concerns regarding their staff position for the course. With this information, teammates can work to both share duties that leverage the relative strengths as well as provide or share in training to address weaknesses. This helps pave the path to confidence in holding each other accountable for important course expectations including laboratory preparation and strong and timely formative feedback, to name a couple. It is also important to ensure that everyone owns or, at least, acknowledges the importance of overarching course goals.

During the semester, regular meetings are critical to staying “on the same page” regarding the progress of the course as measured by its goals. These meetings can range in frequency, format, and mission. However, we have found that the most effective approaches to these meetings involve asking the teaching staff to *do* something – whether it be running through the upcoming activities, debriefing from their experiences, or practicing grading – as opposed to listening to a lecture from the team leader [28]. In Table 1, we demonstrate the variety of regular meetings of lab courses from different levels across engineering disciplines. These sessions can be an important opportunity to meet face-to-face with the whole staff, who may not otherwise see each other if there are multiple lab sections during the week. Often, they are led by the instructor or head TA, and are valuable time spent on preparing, reviewing, and troubleshooting the upcoming experiments. In addition to in-person weekly meetings or email updates, setting up means for more instantaneous communication among the entire staff (such as group chats or channels on Microsoft Teams, Slack, Discord, etc.) is more useful when time-sensitive issues arise during the lab sessions and need to be addressed quickly.

Table 1 - Examples of Course Staff Organizational Structures

Course	Pre-Semester	During the Semester		
	Meetings	Logistics	Topics	Follow-up
Physiology Lab (3 rd year required)	<ul style="list-style-type: none"> Once in person Resources sent over email Written guide 	Frequency: Weekly Manager: Instructor	<ul style="list-style-type: none"> Troubleshoot protocols for upcoming labs Prepare the space and materials (with undergraduate lab staff) Discuss grading with TAs 	<ul style="list-style-type: none"> Group chat Email OneDrive for file sharing
Algebra-Based Intro Physics: E&M & Modern	<ul style="list-style-type: none"> Self-directed training materials 	Frequency: Weekly Manager: Faculty lab coordinator for course	<ul style="list-style-type: none"> Review how previous lab sessions went Rehearse upcoming lab (at least once, depending upon schedule) Answer questions Review grading 	<ul style="list-style-type: none"> Private Teams channel for TAs Teams chat for TAs Email
Intro to Electronics (1 st year required)	<ul style="list-style-type: none"> Welcome new TAs Outline grading, structure, and goals 	Frequency: Weekly Manager: Instructor and Head TA	<ul style="list-style-type: none"> Review most recent lab Review upcoming lab Complete lab exercise Discuss timelines for grading, etc. 	<ul style="list-style-type: none"> Slack Email
Electrical & Computer Eng. First-Year Design Lab	<ul style="list-style-type: none"> Welcome new staff Outline grading, structure, and goals 	Frequency: 2x/week Manager: Instructor/TA (team is mostly undergraduate course aides)	<ul style="list-style-type: none"> Technical training (especially important for undergraduate staff) Grading via rubrics Discuss timelines for grading, etc. 	<ul style="list-style-type: none"> Slack Email

Course	Pre-Semester	During the Semester		
	Meetings	Logistics	Topics	Follow-up
Biomedical Instrumentation Lab	<ul style="list-style-type: none"> Once in-person; Handbook Google Drive archive 	Frequency: Weekly Manager: Instructor	<ul style="list-style-type: none"> Debrief of previous lab Discuss next lab, common issues Start lab run- through if there is time (TAs/undergraduate staff do the lab in small groups on their own) Grading status and questions DEI/Teaching tips 	<ul style="list-style-type: none"> Discord Email
Materials Lab I & Materials Lab II	<ul style="list-style-type: none"> Hybrid logistics meeting Emailed resources Required in-person training for specific experiments 	Frequency: As needed Manager: Instructor	<ul style="list-style-type: none"> Technical issues Grading questions Classroom management 	<ul style="list-style-type: none"> Slack Email

Calibrating Grading and Feedback

Sharpening expectations for grading is critical especially if the lab course has multiple TAs and/or lab sections. Students tend to discuss and compare grades and may feel that the course is unfair if one section consistently scores lower than another. Some TAs may have extensive experience assessing lab reports, while others have never been responsible for grading. Before grading the first assignments, the instructor should have examples from previous semesters, if possible, to demonstrate the range of work quality that may be submitted. The staff responsible for grading can go through a rubric together, with the discussion led by the instructor or TAs who are returning to the staff. Alternatively, each TA can grade the example assignment individually and then the staff can discuss as a group. There should also be a discussion on providing appropriate formative feedback, such as included specific or detailed commentary instead of just marking the answer as incorrect.

During the semester, there are multiple methods that can equalize discrepancies across grading. For example, TAs may decide to swap sections for every other assignment, thereby grading different groups of students. (This can also help students to receive a wider range of feedback styles.) Alternatively, TAs can grade by “problem” or “section” (TA 1 grades questions 1-3 for all reports, TA 2 grades questions 4-6, and so on) for pre-labs or problem sets. Another option is for multiple TAs to submit feedback, but a single TA or team enters all grades for that assignment while utilizing or summarizing that feedback.

Navigating Dissent

Teaching team leaders need to be mindful that dissent is a normal part of healthy group dynamics [29]. Dissent provides opportunities for group members to provide constructive criticism and share experience [30], [31]. However, it is the responsibility of the leader to help the team navigate dissent [31]. Improperly managed dissent can generate problems within a group. Dissent and discord are both normal dynamic interactions, but they are not the same.

Disagreement and dissent can be uncomfortable, and group leaders often respond to dissent as though they are receiving personal criticism of their self-worth, intelligence, or status [32]. Learning to encourage and navigate dissent is a critical skill for co-instructional success. In this section we offer a strategy to provide healthy space for disagreement and discourse in your teaching team and show how it can be applied in specific examples.

A two-component strategy is helpful for managing dissent [31], [32]:

1. Provide an avenue for dissent to occur and be addressed. This helps to develop belonging and responsibility within the group.
2. Establishing leadership boundaries between that emphasize both authority and respect.

When this technique is practiced regularly, dissent can be managed, allowing instructors and students to be empowered and successful in their classrooms.

Navigating Dissent within the Instructional Team

Teaching teams frequently comprise members of different levels and status. These differences often include expectations of team member behaviors. Thus, dissent may arise from “status problems” [33]. The status and power differential between the faculty and TA is important to manage. Ensuring healthy dissent occurs in the faculty-TA co-teaching relationship is critical for TA professional development and course success [33]. An example between the faculty coordinator and a member of the TA team:

A new coordinator, but experienced instructor, has the responsibility of making the weekly quiz. The topics are intended to be aligned with the previous week’s lecture topics and homework. The duration of the quiz is intended to be 20 minutes or less.

A weekly quiz was produced and distributed to the TA team several days in advance of the first class of the week. That week included a holiday precluding the regular weekly meeting. Because the coordinator was new to the course and student population, the quiz was a little longer than the intended 20 minutes. The quiz was, however, completely appropriate to the subject of the weekly discussion lesson. The TAs were invited to review the quiz in advance of their session.

A TA came flying in a full rage into the coordinator’s office on the first day of the discussion week, explaining how the coordinator did it all wrong and the quiz did not meet their [the TA’s] self-determined length.

In this example the dissent came in both the form of legitimate dissent [33] (the quiz was overly complicated—it covered too much disparate material) and personal attacks (the coordinator

needed instruction from the TA about how to be an instructor) [30]. To help resolve the dissent, the two-step strategy was deployed as follows:

1. Provide an avenue for dissent to occur and be addressed.
 - a. Distribute the quiz in advance of the meeting for the TAs to review and provide comments.
 - b. Encourage comments/criticism on the materials at the weekly meeting.
2. Establishing leadership boundaries between that emphasize both authority and respect.
 - a. Do not editorialize the quiz (or other materials) in front of the students.
 - b. Students are always welcome to discuss the class materials with the coordinator.

An additional component of setting boundaries and holding responsibilities is that TAs do not have to defend course materials. Since the TAs do not have the power to change the course materials, it is not appropriate for them to shoulder the responsibility for the creation or implementation of the materials on behalf of the course instructor. The purpose of this statement is not to disenfranchise the TAs, but rather to support the power that they have while maintaining respect and established protocols for navigating dissent across status levels ranging from student through to the instructor of record.

Conclusion

Learning to teach and learning to lead a teaching team are ongoing, iterative processes that require practice and reflection, and, most importantly, experience. In the process of developing that experience, it is still important to make sure that your course is able to function and members of your team are able to do their jobs to the best of their current abilities. In this paper we have provided considerations for instructors as they work with their teaching teams to address practical concerns for running their course. These include understanding the background and motivations of your teaching team, establishing clear expectations, and providing space to navigate dissent. While not an exhaustive list of concerns, we have focused on these areas as specific topics that have come up in discussions with novice course leaders that can have an important and timely impact on the success of their course.

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