

Teaching and Practicing Teamwork in Industry and Academia

Naomi A. Kleid

The purpose of this paper is to help educators and trainers design realistic working environments for team writing assignments and, thus, to prepare students to function on high-performance teams in the workplace.

This paper describes differences and similarities between academic and industrial team working environments. It focuses on the kinds of tasks teams are asked to perform, the time and other constraints under which teams operate, the types of considerations that go into selecting people to participate in a team, the members' expectations about teamwork, the rewards used to recognize effective teamwork, and the role of the manager or course instructor. This paper offers suggestions to address some of the key challenges.

CREATING REALISTIC TEAM WRITING ENVIRONMENTS

At a minimum, "teaching teamwork" means teaching people to work with other people to get a job done. In the teaching and learning experiences I will describe, the "job" included working in a team to do two things: (1) produce a written deliverable that students could use as a portfolio piece, and (2) make an oral presentation based on that deliverable.

I returned to academia after working in industry for 23 years (as a team leader, information planner, and human factors engineer for IBM). I want my college juniors and seniors and my continuing education students to know what to expect and be prepared to succeed when they get jobs in industry. Consequently I try to make my team writing assignments as much like industry tasks as possible, and I try to create team working environments in which engineering and programming students will be more likely to act like the professionals they are soon to become. It is challenging to create realistic tasks and working environments, because academia and industry differ in significant ways. This paper discusses some of the differences and offers suggestions to narrow some of the gaps. (Most of my comments are based on experience teaching a 3-credit, 16-week course *Communication for Engineering and Technology* at NC State University.)

DIFFERENCES BETWEEN INDUSTRY AND ACADEMIA

The environments in industry and academia differ in ways that include: the kinds of tasks teams are asked to

perform, the time and other constraints under which teams operate, the types and number of considerations that go into selecting people to participate in a particular team, the members' expectations about teamwork, and the rewards used to recognize effective teamwork.

Tasks Differ

As a teacher, I believe it is necessary to challenge students with achievable tasks. The undergraduate teaching-learning experience would not be effective if it involved unreasonable demands, overly stressful situations, or a large part of the semester devoted to a project that was not completed. These considerations are my constraints.

Depending on the class, my students must work in a team to write a step-by-step instruction manual, proposal, or project report. I tell my students that "failure is not an option; you must ensure that your team succeeds at the task, or you will not get credit for the course." This creates enough stress for them to take the teamwork project seriously. I believe this demand is reasonable, because I know that the task is achievable, and I will be there to teach them and help them along the way.

In industry, teams are challenged with tasks that may not be achievable – certainly not within the time, knowledge, funding, and other constraints that apply to the project. Usually part of the team's job is to keep management abreast of their progress and alert management to any "show stopper" problems. If the team fails to complete their task but their failure is for "good" reasons and their work moves the company ahead in some way, then the team members may still get "credit" for their effort.

Time Constraints Differ

Time constraints involve duration, intensity, and continuity of involvement. In an academic setting, a team assignment is often constrained by the academic calendar, which may limit task complexity and team development. Although it is possible to have a team stay together for longer than one semester or part of a semester, this is rare. Also in an academic setting, students are committed to more than one course. Often they are seriously overextended taking several courses and working at the same time. When a student drops a course that involves teamwork, the team must adjust to that loss and continue to complete the assignment.

In industry, the length of the assignment is frequently unknown, but it is likely to be longer or shorter than originally anticipated. The amount of individual multitasking may be less intense but most, if not all, team members may be working on multiple teams or multiple tasks. In a multifunctional team (based on a matrixed organization,¹ which obtains team members from different departments), staff availability may be unpredictable as management priorities change over time. When a person is there one day and gone the next, the team leader (who may be called "team lead" or "project manager") must negotiate for the return of that resource based on need. Sometimes you win and the person comes back. If you lose, you complete the task as best you can.

Time considerations are important; they will be discussed again in the section on *Seeking Performance*.

Team Assignment Considerations Differ

In industry, my teams have ranged from two to more than 20 people. In my classes, I try to have four or five people on a team, but team sizes have ranged from two to eight people. I ask students whom they would like to work with (so I know which people are friends), then I assign people to teams based on a large number of factors: ability, gender, English proficiency and national origin, major, personality and friendships, and work experience. Felder and Brent² provide some guidance that I follow and some that I modify. I also apply principles from small-group communication.

When I consider ability, I follow Felder and Brent's advice and assign students with a mix of ability levels to a team. Rather than use grades from other courses, I measure ability by writing competence demonstrated on individual assignments that students complete during early modules of the class, before the team project starts.

When I consider gender, I modify Felder and Brent's recommendations. Rather than dispersing the few senior women students I have among all of the teams (which, unfortunately, may be an accurate reflection of the current industrial environment in which women engineers often work), I try to put two women together on a team. I have observed that when one woman student works with three or four men, two ineffective things tend to happen: either she becomes an "isolate" who works alone or who interacts with few of the men (see Figure 1), or she becomes a "secretary" who types and corrects all of the men's contributions. When I assign two women to work with two or three men, the roles seem to be more flexible and everyone has an opportunity to learn by trying several tasks. (An all-woman team would also offer role flexibility.)

When I consider English proficiency, I also consider national origin. I have many students for whom English is a second language. If their writing ability is **not** strong, I disperse them individually among the teams, so that the stronger writers can help the weaker writers. If their writing ability **is** strong, I try to let at least two students stay together, especially if they are friends. As with the gender consideration, two multicultural students will add a positive amount of diversity to a team, when one alone may become an isolate.

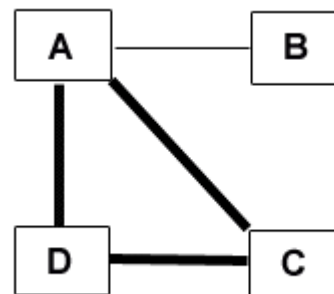


Figure 1. Four people: three are "highly interconnected"³ and one ("B") is a relative "isolate" with weak communication to one other person.

When I consider students' major fields of study, I try to assign students with different majors to each team, because most large writing tasks require a variety of skills, training, and problem-solving approaches that may be taught and learned differently in different disciplines.

When I consider personality or personal style, I try to keep similar people and friends together, because teamwork requires interaction. Not only do likes attract and opposites repel,^{4, 5} but I have already introduced diversity of thinking and background in other ways.

I tried teaching Myers-Briggs personality types to some teams,^{6, 7} but unlike IBMers who were interested in these differences, my students seemed bored or overwhelmed. Perhaps the students considered personality differences subtle or trivial compared with the more striking life-style differences they encounter on campus every day (see discussion in the next section).

When I consider work experience, I distribute students with significant work experience across the teams rather than keep them all together so that, if possible, each team has a person who might model a professional's attitude or who might serve as a potential, strong leader. Although I try to provide each team with someone who is likely to emerge as a leader, I do not assign leaders. I let the teams discover their own leaders and develop their own organizational structure (see discussion in the section on *Team Leadership*).

Many of these considerations are different from team assignment considerations in industry, where creating teams with the necessary set of skills is paramount and where leadership is often assigned. I have never considered, or been aware that other people considered, such factors as gender or national origin when assigning people to teams in industry. Instead, we consider who is available and try to choose people who have the most appropriate past experience, the best skills, and the strongest work ethic, which includes motivation, commitment, and productivity.

Why do we need to consider more team assignment factors in academia than in industry?

The smaller number of considerations in industry is usually sufficient because we are constructing teams of professionals who know how important teamwork is. By definition, user-centered design projects are done in multifunctional teams, which usually include human factors specialists, writers, and engineers; they may also include marketing, support, test, and other functions. It is probably fair to say that all large writing projects, and many smaller ones, are also done in teams. Even if there is only one writer, that person will be supported by someone who planned or stated the purpose for the communication, someone who provided the graphics or designs the layout, several reviewers, and, if the writer is lucky, an editor.

As professionals, we know that at least some of the members of our team are likely to work together again on another project, so we need to not only complete the work well, but also treat each other in ways that will make productive interpersonal interaction likely in the future. We expect these attitudes from professionals, but we cannot count on them in the classroom. Many of my students seem not to expect to work with their teammates again after the assignment is over. Most have yet to learn the value of networking or appreciate the fact that some professional relationships may last a lifetime.

In industry, we operate within an environment that has shared expectations and stated "rules" that often support teamwork. Within IBM, one motto was: "Respect for the individual." Having such a statement gives the team something to fall back on to prevent the worst excesses of counterproductive behavior. Felder and Brent suggest that student teams start by developing their own statements of ground rules, such as: I will attend all meetings, do my work by its due date, and help my teammates. I have not required my teams to write a list of expectations, but I have asked them to share their contact information, their commitment for the number of hours a week that they will work on this task, and what they consider to be their strengths and abilities. Most of the teams seem to create and adjust their expectations along the way.

The larger number of team assignment considerations in academia may also be necessary because the academic environment offers many more striking differences in behavior and life-style choices than does the industrial environment. For example, in academia, we have people who want to spend most of their time "partying," or studying, or working at their computer, or playing sports, or working on political concerns. In industry, some of these life-style choices are less obvious, if present at all. I try to manage this wide range of personal differences in an academic setting by letting friends work together on teams, if possible.

Bottom line, I consider all these team assignment factors because I try to create teams that will have a variety of skills so they can accomplish the tasks; and I try to create an environment where interpersonal relationships will strengthen, perhaps into friendships, by increasing the likelihood of having team organizations that promote friendship, learning, and performance.

Team Leadership and Team Organization Expectations Differ

In my experience, undergraduate students expect to have a leader direct their work; professionals expect to contribute as responsible colleagues. Undergraduate students want to be told what to do; professionals want to help figure out what needs to be done and then either do it or negotiate with other people on the team about how to do it. Undergraduate students are uncomfortable with uncertainty, lack of structure, and negotiation (as are many people), but professionals know they must manage uncertainty, create structure, and negotiate differences.

Students seem to expect to work in what Katzenbach and Smith⁸ call a "working group" and they expect to have a leader, preferably someone whom I assign. A working group looks like Figure 2 or Figure 3; but the same working group will not look like both figures, even at different points in time, because each figure has a different leader. This is a fine structure for simple, containable tasks that are not particularly challenging.

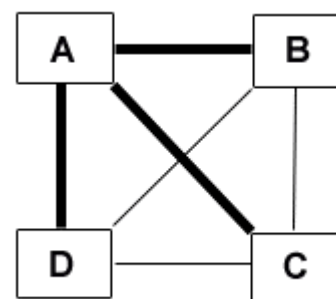


Figure 2. Four people: "A" is the leader, and they all communicate.

As mentioned earlier, in industry we often have assigned leaders, but at IBM, at least, team leaders were often trained in project management and interpersonal communication; they were keenly sensitive to issues involving organizational communication. As a team leader of professionals from a range of functional areas, I found that usually there was little problem and much benefit to sharing leadership tasks, when that was appropriate. (However, I would remain the responsible party and make key decisions, because I was assigned that role.) An open approach to leadership might look like Figure 2 at one point in time and like Figure 3 at another time, depending on the task and the distribution of knowledge on the team. It might look like Figure 4 or Figure 5 when those interaction patterns are appropriate.

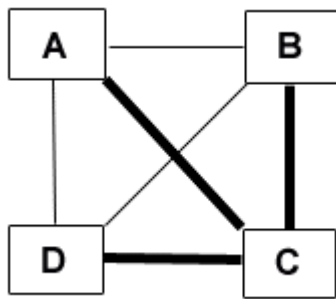


Figure 3. Four people: "C" is the leader, and they all communicate.

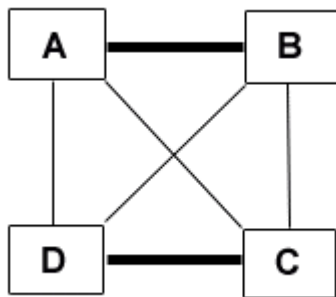


Figure 4. Four people: two "dyads" work separately ("A" with "B" and "C" with "D"), and they all communicate.

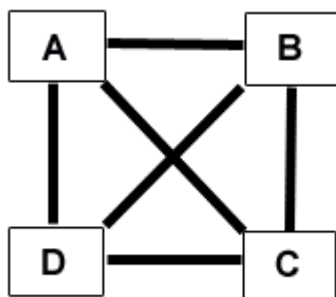


Figure 5. Four people: all are highly interconnected; all communicate.

A flexible organizational structure fits well with what Katzenbach and Smith define as "real teams," which they recommend for solving complex problems, and "high-performance teams," which they recommend for solving complex problems and achieving peak creative performance. Both types of Katzenbach and Smith teams have multiple leaders and elicit from their members high levels of effort and commitment to the task – perhaps because more people are permitted to participate in leadership capacities during the different tasks that comprise the team's total project. High-performance teams go one step further than real teams; they create an environment in which everyone on the team is committed to the success of everyone else.

I would like my students to experience what it is like to work on a real team. Ideally, I would like them to experience working on a high-performance team, because I've worked on high-performance teams and those were peak experiences in my life. Consequently, I do not assign leaders. I hope that after the students share their strengths with the other members of their team, the team members will realize they have different people who can lead or simply accomplish the different tasks that need to be performed.

Seeking performance and finding the essence of teamwork: To push performance one step further and hopefully create high-performance teams, I tell the students that I will give everyone who earns it an A for the course, and I will give A-pluses if they earn them. They are not competing against each other or even against the other teams; they are just trying to create the best possible written deliverable in the time available.

The time constraints generally create additional performance pressure, and more is added by the lack of specified team structure. In the case of my instruction-manual classes, additional stress is added because each team is able to design the device for which they will write step-by-step assembly instructions. The teams must spend energy and time dealing with all of these concerns; but according to Katzenbach and Smith, some degree of pressure is needed to forge a high-performance team.

It is important to give the teams sufficient time to form, work through the stresses, do their work, and consolidate what they learned, so that they know how to repeat their successes and deal with their problems better next time. To become high-performance teams, it is generally agreed that teams must go through four phases. Katzenbach and Smith call these phases: forming, storming, norming, and performing. Blanchard, Carew, and Parisi-Carew⁹ call these phases: orientation, dissatisfaction, resolution, and production. While some of these phases can be brief, the total process plus the writing tasks and related work all take time.

For my instruction-manual assignment, I gave the teams 8 weeks to create their device and draft, revise, edit, and test their manuals. After they delivered the final version of their manual, I gave them 3 weeks to work on tasks that helped them process their experience. I used lectures, discussions, and consultations to teach them what they needed to know along the way. I also gave them interim deadlines to keep them moving. For my proposal-writing class, I gave the groups 3 weeks to form their teams; develop, write, and edit their proposals; and make an oral presentation on their project. That was just enough time to do the work; but it did not give them sufficient time to consolidate what they learned.

Some manual-writing students have complained that they wanted less freedom, less time, and more direction. Usually, however, the students who complained did not emerge as team leaders. Instead, the students who assumed leadership roles within their teams have been ones who took responsibility when faced with uncertainty. To me, this seems to be appropriate leadership training. I hope the students learned from this that a "leader" is not someone who is bossy but someone who works hard and willingly accepts responsibility for what must be done. I also hope they learned that a "non-leader" is not a passive follower waiting to be told what to do. I wanted them to realize that they are **all** free to take responsibility and contribute to the work of the team. If they learned these things, I believe they learned the essence of teamwork.

Of course, team roles other than leader and non-leader are also important, but they all hinge on having an attitude that fosters productive performance. (I will not discuss other team roles here.)

Rewards Differ

In industry, a significant raise or bonus given to one outstanding person may mean that others receive less than their due. Compensation can be offered as non-monetary recognition, but not forever. At some point, even people who can be motivated by non-monetary rewards^{10, 11} will begin to feel less than appreciated and act accordingly. Because of what often is presented as a simplified zero-sum reward structure, people are encouraged to evaluate each other critically. Critical evaluations, especially during the time people are working together on a team project, can destroy the likelihood of a team becoming a high-performance team. In a high-performance team, people need to be contributing their best efforts in a spirit of cooperation, rather than competition; and they all need to work toward getting the highest possible gain for all of the team members.

At school, the ultimate reward is an A-plus and a letter of recognition or recommendation from the teacher. If we grade on a curve, then we have the equivalent of a zero-sum reward structure; but if we give an A to all of our students who earn it, we can foster cooperation rather than competition. I choose to foster cooperation, but not be naïve about it.

I focus on accentuating the positive. I require each student to do part of the work and put his or her name on some of the pages the team turns in as the final deliverable. I give all the students on the team the grade that the total deliverable earned. In this way, students are encouraged to demand the highest level of performance from each team member.

In addition, after the teams submit their deliverables for grading, I ask the students to vote for the "most valuable player" (MVP) on their team and give reasons why. I apportion 5% of each person's grade based on the voting. The one student who gets the highest MVP score on the team gets the full 5%; everyone else gets less in proportion to the number of points they received. In this way, I don't ask students to criticize each other; but if someone gets zero points or a point score that is much lower than the other people on the team, I know that person did not contribute very much, and I can adjust that person's course grade downward. (In addition to being based on the teamwork assignment, grades reflect performance on individual writing tasks that each student completed.)

The MVP voting worked with five out of six of my manual-writing classes. In the sixth case, the class had an exceptional high-performance team that taught another high-performance team how to break the system. Both teams agreed to give all of their members the same number of points, which meant that all of these team members got the highest possible benefit. I thought this was great teamwork. The other two teams did not go along with this plan because, as they told me later, each had one slacker whom they wanted to punish. In industry, I never saw teams cover for slackers as well as these teams did, and frankly I wish they had told me about their problems sooner. Also in industry, I never saw teams collude to maximize the reward system as well as the two high-performance teams did. I think the high-performance teams clearly learned about teamwork.

THE BIGGEST CHALLENGE IS THE SAME

The biggest challenge in teaching teamwork is the same challenge that managers face in industry. It is necessary to let the teams manage themselves, especially if they are going to become real teams or high-performance teams, and even if they are going to function as working groups

with just one strong leader. Otherwise the teacher or manager becomes a quasi-member of each team, which changes the interactions among the team members and distracts them from focusing on their relationships with each other and their performance on the challenging task at hand. It also can create an exhausting workload for the teacher or manager. One of my students who had co-op work experience explained the role he saw me play: "The teacher acted like a second-line manager and oversaw the teams, which managed themselves."

However, when the teams are forming and developing their organizational structure, they are likely to experience stress and problems. A snapshot of team interaction during a crisis may well show a dysfunctional organization (for example, recall the image of the isolate in Figure 1 or the dyads in Figure 4) or a totally democratic and perhaps unstructured organization (recall the totally interacting team in Figure 5). Only time can tell if the team is operating as an adaptive system¹² and using different interaction patterns because they are appropriate at different stages in the project to get the work done, or if the team is falling apart.

But time is limited and I want to avoid failure, so I ask the teams to submit a draft of their deliverable that I carefully review; I require weekly status reports that must identify any problems they are having so that I can help; and I keep my office door open for drop-ins who may not want to say they are having a problem but who want some personal advice. I've never had a team fail, but I've been worried and frustrated on more than one occasion, and I've intervened a couple of times.

In the end, when we teach teamwork, we try to construct assignments that are achievable yet realist, we try to teach students what they need to know to perform the tasks and team functions, we seed the teams with the best mix of skills and other factors that we can manage, we establish an environment that is challenging and promotes cooperation, and we watch carefully and help when appropriate. We hope that the teams will work through the team-building process, and learn from the stresses that are a natural part of that process; we hope that they will become high-performance teams. And we hope that they will carry what they learn about teamwork, responsibility, and performance into the workplace and be better prepared to succeed as knowledgeable, contributing team members.

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Naomi A. Kleid, Ph.D.
 President, InfoExact, Inc.
 104 Muses Court
 Cary, NC, 27513 USA
 919.319.9786
 www.infoexact.com
 nakleid@mindspring.com

Naomi Kleid is President of InfoExact, Inc., a consulting company specializing in training, technical writing, customer surveys, and usability. She has a Ph.D. in Communication and Rhetoric (with a specialization in Communication Research Methods) from Rensselaer Polytechnic Institute; she worked for IBM for 23.5 years in the U.S. and France; and she has teaching experience in a variety of university and adult-education environments. Naomi is a Senior Member of STC and contributes to the Carolina Chapter and the Usability SIG.