INTRODUCTION

More than ever, engineering schools are requiring their students to work in teams. These teams take various forms: collaborative study groups; laboratory groups; design groups as part of individual classes; and design groups participating in extracurricular competitions, such as the solar car, super mileage vehicles, human powered vehicles, SAE formula cars, concrete canoes, bridge designs, Rube Goldberg projects, and many others. This team emphasis in engineering schools mirrors a management philosophy, which capitalizes on the use of teams that has swept through the corporate world in the last few decades.

Engineering employers, in fact, are the principal drivers for the use of teams in engineering schools. They seek engineering students who have team skills as well as technical skills. The purpose of this chapter is to communicate a team vision, to show why teams and collaboration are so important to organizational and technical success, and to give practical advice how to organize and function as a team.

If you study this chapter, work through the exercises, and examine some of the references, you should have most of the tools you need to be a successful team member and team leader while in engineering school. Apply the principles in this chapter to your team experiences in school and learn from and document each. By so doing, you will have a portfolio of team experiences that will be a valuable part of your résumé. Above all, you will have the satisfaction that comes from being a part of great teams, and great teams can be fun.



VOCABULARY

Collaborative (adj): characterized or accomplished by collaboration.	Collaborate (n): to work, one with another; cooperate, as on a literary work.
Extracurricular (adj): outside the regular curriculum or program of courses.	

WHY DO CORPORATIONS FOCUS ON TEAMS?

A full-page advertisement in USA Today (1991) elucidated the highly competitive climate in industry and what Chrysler (now Daimler Chrysler), for example, was doing about it. The use of interdisciplinary teams was an important part of the solution:

"No more piece-by-piece, step-by-step production. Now it's teams. Teams of product and manufacturing engineers, designers, planners, financing and marketing people-together from the start. . . . It's how we built the Dodge Viper from dream to showroom in three years, a record for U.S. car makers. From now on, all our cars and trucks will be higher quality, built at lower cost and delivered to the market faster. That's what competition is all about."

The greater the problem, the greater the need for the use of teams. Individuals acting alone can solve simple problems, but tough problems require teams. This section lists and then discusses the reasons many organizations have embraced the use of teams. Why is the use of teams so popular today?



- Engineers are asked to solve complex problems.
- More factors must be considered in design than ever before.
- Teams provide for greater understanding through the power of collaboration.
- Many corporations are international in scope, with design and manufacturing engineering operations spread across the globe.
- Since Time to Market is extremely important to competitive advantage, concurrent engineering, inherently a team activity, is widely employed.
- Corporations are increasingly using project management principles.

VOCABULARY

Marketing (n): the total of activities involved in the transfer of goods from the producer or seller to the consumer or buyer, including advertising, shipping, storing, and selling.

QUICK PROFILES OF GREAT TEAMS

We understand more today than ever before of the importance of and power of creative collaboration. One recent book on the subject is *Organizing Genius: The Secrets of Creative Collaboration*, by Warren Bennis and Patricia Ward Biederman (1997). Their first chapter is titled "The End of the Great Man," in which they argue that great groups can accomplish more than talented individuals acting alone, stating that "None of us is as smart as all of us." They cite a survey by Korn-Ferry (the world's largest executive search firm) and The Economist in which respondents were asked who will have the most influence on global organizations in the next ten years. Sixty-one percent of the respondents answered "teams of leaders," whereas 14 percent said "one leader." Individual chapters of their book focus on great groups. A chapter on the Manhattan Project discusses the development of the atomic bomb during the Second World War by a team of great scientists. One chapter discusses Lockheed's Skunk Works, which developed the U-2 spy plane, the SR-71 Blackbird, and the F117-A Stealth fighterbomber used in the Persian Gulf War. Another example is the development of the graphical user interface at Xerox's PARC (Palo Alto Research Center) and its adoption into the Macintosh computer by Steve Jobs and Steve Wozniak. Steve Jobs' goal was to lead his team to create something not just great, but "insanely great," to "put a dent in the universe."

Another recent book on collaboration is *Shared Minds: The New Technologies of Collaboration*, by Michael Schrage (1990). He defines collaboration as "the process of shared creation: two or more individuals with complementary skills interacting to create a shared understanding that none had previously possessed or could have come to on their own." He cites examples of collaboration in science (Watson and Crick; Heisenberg, Bohr, Fermi, Pauli, and Schrodinger; Einstein and Marcel Grossman), music (Gilbert and Sullivan; Rodgers and Hart; McCartney and Lennon), art (Monet and Renoir; Van Gogh and Gauguin; Picasso and Braque), and literature (editor Maxwell Perkins and writers F. Scott Fitzgerald and Thomas Wolfe; Ezra Pound and T. S. Eliot).



James Watson and Stanley Crick, winners of the Nobel Prize for discovering the double helix structure of DNA credit their collaboration for their success: "Both of us admit we could not have done it without the other. We were interested in what the answer is rather than doing it ourselves." Crick wrote that "our . . . advantage was that we had evolved . . . fruitful methods of collaboration." Sir Isaac Newton, father of classical physics, in a letter to his contemporary (and rival) Robert Hooke, recognizing his debt to fellow scientists, wrote: "If I have seen further (than you and Descartes) it is by standing on the shoulders of Giants." Modern physics also found its genesis in collaboration. Heisenberg, Bohr, Fermi, Pauli, and Schrodinger, all Nobel laureates for their roles in founding quantum physics, worked, played and vacationed together as they developed their revolutionary new ideas together.

THE INCREASING COMPLEXITY OF PROJECTS

Engineers are asked to solve increasingly complex problems. The complexity of mechanical devices has grown rapidly over the past two hundred years. David Ullman, in his text *The Mechanical Design Process* (1997), gives the following examples. In the early 1800s, a musket had 51 parts. The Civil War era Springfield rifle had 140 parts. The bicycle, first developed in the late 1800s, has over two hundred parts. An automobile has tens of thousands of parts. The Boeing 747 aircraft, with over five million components, required over 10,000 person-years of design time. Thousands of designers worked over a three year period on the project. Most modern design problems involve not only many individual parts, but also many subsystems— mechanical, electrical, controls, thermal, and others—each requiring specialists acting in teams.



VOCABULARY	
Genesis (n): an origin, creation, or beginning.	Quantum physics or Quantum mechanics (n): a theory of the mechanics of atoms, molecules, and other physical systems that are subject to the uncertainty principle.

Engineering designers must consider more factors than ever before, including initial price, life cycle costs, performance, aesthetics, overall quality, ergonomics, reliability, maintainability, manufacturability, environmental factors, safety, liability, and world market acceptance. Satisfying these criteria requires the collective teamwork of design and manufacturing engineering, marketing, procurement, business, and other personnel. The typical new engineering student, being interested primarily in technical things, tends to believe that engineers work isolated from other factors, always seeking the best technical solution. This is not true. Engineering involves solving difficult problems and finding technical solutions while considering numerous constraints. Engineers make things happen; they are doers. Engineers often stand astride boundaries in organizations. They are technical experts who also understand the economics and dynamics of the business enterprise.



THE INTERNATIONAL FACTOR

Many corporations are international in scope, with global design and manufacturing engineering operations. These operations require teams to work together who may never physically meet. Instead, they meet and share data via electronic means. For example, design engineers in the United States commonly collaborate on a design with Japanese engineers for a product to be manufactured in China. Manufacturing personnel from the Chinese plant may also contribute to the project. As another example, software engineers in the United States, the United Kingdom, and India may collaborate on a software project around the clock and around the world. At any time during a 24-hour period, programmers in some part of the world will be working on the product.

VOCABULARY

Life cycle costs (n): the total costs estimated to be incurred in the design, development, production, operation, maintenance, support, and final disposition of a major system over its anticipated useful life span.	Aesthetics (n): the branch of philosophy dealing with such notions as the beautiful, the ugly, the sublime, the comic, etc., as applicable to the fine arts, with a view to establishing the meaning and validity of critical judgments concerning works of art, and the principles underlying or justifying such judgments.
Ergonomics or Human engineering (n): an applied science that coordinates the design of devices, systems, and physical working conditions with the capacities and requirements of the worker.	Corporation (n): an association of individuals, created by law or under authority of law, having a continuous existence independent of the existences of its members, and powers and liabilities distinct from those of its members.
Constraint (n): limitation or restriction.	

THE NEED FOR SPEED:

Concurrent engineering is widely employed in order to achieve better designs and bring products to market more quickly. Time to Market is the total time needed to plan, prototype, and procure materials and to create marketing strategies, devise tooling, begin production, and bring a new product to market. In the traditional company, each of these steps is done serially, one at a time. It is a relay race, with only one person running at a time, passing the baton to the next runner. The design engineer "tosses a design over the wall" to a manufacturing engineer who may not have seen it yet. Then it is tossed over the wall to the procurement personnel, and so on. Concurrent engineering, on the other hand, is a parallel operation. Like rugby, all of the players run together, tossing the ball back and forth. Marketing, manufacturing, and procurement personnel are involved from the beginning of the design phase. The use of teams, as well as new technologies such as CAD/CAM, rapid prototyping, shared data, and advanced communications have radically changed the process of engineering. By using teams and CAD/CAM technologies, in the face of fierce international competition, U.S. auto makers have cut the time needed to bring a new car to market from approximately five years to fewer than three years.



Speed—the timely delivery of products to the marketplace— is critical for companies to be profitable. Jack Welch, General Electric's widely respected former CEO (see his biographical sketch in Chapter 6), has said "we have seen what wins in our marketplaces around the globe: speed, speed, and more speed." Xilinx Corporation has stated that its research shows that a six-month delay in getting to market reduces a product's profitability by a third over its life cycle. A Business Week article stated: "Reduce product development time to one third, and you will triple profits and triple growth."

VOCABULARY

Time to market or TMM (n): the length of time it takes from a product being conceived until its being available for sale. TTM is important in industries where products are outmoded quickly.	Procurement (n): the act of obtaining equipment, materials, or supplies.

Developing new products is a key to growth and profits. During a recent year, Rubbermaid Corporation introduced 400 new products—more than one per calendar day! At least one third of Rubbermaid's $2 billion in annual sales come from products which have been in existence fewer than five years. 3M Corporation CEO L.D. DiSimone, facing flat revenues and stiff competition, adopted a business focus of generating 30 percent of revenues from products fewer than four years old. The creative thought processes, the innovation needed to create a steady stream of new ideas, and the expertise to manufacture and bring these to market quickly are all functions that teams perform well.It is important for engineering students to understand the importance of speed (without compromising quality). Delays have many negative consequences. Engineering professors who supervise teams should provide incentives to students for early completion of team projects or at least penalties for failure to meet deadlines. Student teams should recognize the importance of speed, push themselves and their teams toward early completion of projects, and document their successes on their résumés and/or portfolios.



PROJECT MANAGEMENT USES TEAMWORK

Project management is widely practiced in industries and government labs. Many engineers discover on their first job that they will frequently work in project-oriented teams. Unfortunately, most engineering students never take a project management class. Project management principles were developed in the defense industry in the 1950s and 1960s as a way to manage department of defense contracts. The typical corporation is organized by vertical divisions or lines, where individuals are clustered by job functions. For example, a corporation may have separate research, manufacturing, engineering, human resources, product development, marketing, and procurement divisions. Project management is a way of

VOCABULARY

Incentive (n): something that incites or tends to incite to action or greater effort, as a reward offered for increased productivity.	Penalty (n): a loss, forfeiture, suffering, or the like, to which one subjects oneself by nonfulfillment of some obligation.

organizing individuals not by function but by products or projects. Selected individuals from research, engineering, manufacturing, human resources, procurement, and other divisions are gathered together as a team for a particular purpose, for example, solving a corporate problem, developing a new product, or meeting a crucial deadline. A project management approach, therefore, is inherently a cross-functional team approach and an excellent way to solve problems. Successful project management, however, is not an easy task.

The project managers' job is to complete a project, on time, within budget, with the personnel that they are given. Unfortunately, they are rarely able to hand pick their personnel, and their supervisors and/or customers typically set the project completion time and budget. In other words, project managers are never given all the people, time, and money they need. These tough constraints are often mirrored in student design teams. Their teacher picks the team members, they do not have much money or resources to work with, and their teacher determines the time frame. These conditions are uncomfortable for students, but they prepare students for the engineering world.

("Semi-Conscious Objectors"): Gantt Chart for Object Relocator: Fall 2000										
Task	*Leader(s)*	*Oct. 11-17*	*Oct. 18-25*	*Oct. 26-31*	*Nov. 1-7*	*Nov. 8-14*	*Nov. 15-21*	*Nov. 22-28*	*Nov./ Dec. 29-5*	*Dec. 6-12*
Finalize Design	Team	■								
Procure Materials	Joe	■	■							
Pick-Up Module	Jaime		■							
Conveyor Assembly	George		■							
Working Prototype	Team			■	■					
Fine Tuning Machine	Jaime/Team				■	■				
Instruction Manual	George				■	■				
Professor Tests Projects	Team						■			
Report Rough Draft	Sarah				■	■	■			
Finalize CAD Drawing	Ahmad				■	■	■			
Presentation	Ahmad/Joe							■	■	
Final Report Due	Team									■
Judges Test Best Two Projects Per Class	Team									■

TABLE 13.1 A Sample Gantt Chart

VOCABULARY

Cross-functional (adj): denoting or relating to a system whereby people from different areas of an organization work together as a team.

Project managers use tools that any team leader would benefit from learning how to use. Project managers plan the work requirements and schedules and direct the resource use (people, money, materials, and equipment). One popular project management tool that student teams should learn to use is the Gantt chart. (A simple Gantt chart is pictured in Fig. 13.1.) A Gantt chart organizes and clearly presents information on task division and sequencing. Tasks are divided into subtasks. The shading conveys the sequence in which the tasks should be completed and how long a task is expected to take. In our version, the person(s) responsible for each task is listed.

Project managers monitor projects by tracking and comparing progress to predicted outcomes. They use project management software such as Microsoft Project for planning and monitoring purposes. Project managers carefully guard the scope of the project from excessive mission creep (a never-ending expansion of purpose). A project is successful if it is completed on time, within budget, at the desired quality, and with effective utilization of resources. For more information on project management, consult any text on Project Management and read the publication titled "PMBOK: Project Management Body of Knowledge" at http://www.pmi.org, the website of the Project Management Institute.



WHAT MAKES A SUCCESSFUL TEAM?

Have you ever been a member of a great team? It's a great experience, is not it? On the other hand, have you ever been part of an unsuccessful team? It was a disappointing experience, wasn't it? How do you measure or evaluate a team's success or failure? What specific factors make a team successful? What factors make a team a failure?

First, it is important to define what a team is and is not. A team is not the same as a group. The term "group" implies little more than several individuals in some proximity to one another. Team, on the other hand, implies two or more persons who work together to achieve a common purpose. The two main elements of this definition are purpose and working together.

VOCABULARY

Gantt chart (n): a chart depicting progress in relation to time of projects, tasks, schedules, etc.

All teams have a purpose and a personality. A team's purpose is its task, the reason the team was formed. Its personality is the collective style of its people and how the team members work together. Each team has its own style, approach, dynamic, and ways of communicating which are different from those of other teams. For example, some teams are serious, formal, and businesslike, whereas others are more informal, casual, and fun-loving. Some teams are composed of friends; others are not. Friendship, though desirable, is not a necessary requirement for a team to be successful. Commitment to a common purpose and to working together is required. Regardless of style or personality, a team must have professionalism. A team's professionalism ensures that its personality promotes productive progress toward its purpose.

TEAM ATTRIBUTES

The successful team should have the following attributes:

1. A common goal or purpose. Team members are individually committed to that purpose.

2. Leadership. Though one member may be appointed or voted as the team leader, every team member should ideally contribute to the leadership of the team.

3. Each member makes unique contributions to the project. A climate exists in the team that recognizes and appropriately utilizes the individual talents/abilities of the team members.

4. Effective team communication. Regular, effective meetings; honest, open discussion. Ability to make decisions.

5. Creative spark. There's excitement and creative energy. Team members inspire, energize, and bring out the best in one another with its can do attitude. This creative spark fuels collaborative efforts and enables a team to rise above the sum of its individual members.

6. Harmonious relationships among team members. Team members are respectful, encouraging, and positive about one another and the work. If conflicts arise, there are peacemakers on the team. The team's work is productive and fun.

7. Effective planning and use of resources. This involves an appropriate breakdown of tasks and effective utilization of resources (people, time, money).

VOCABULARY

Professionalism (n): the standing, practice, or methods of a professional, as distinguished from an amateur.	Peacemaker (n): a person, group, or nation that tries to make peace, especially by reconciling parties who disagree, quarrel, or fight.

TEAM MEMBER ATTRIBUTES

Individual team members of a successful team should have the following attributes:

1. Attendance. Attends all team meetings, arriving on time or early. Dependable, faithful, reliable. Communicates in advance if unable to attend a meeting.

2. Responsible. Accepts responsibility for tasks and completes them on time, needing no reminders or cajoling. Has a spirit of excellence, yet is not a perfectionist.

3. Abilities. Possesses abilities the team needs, and contributes these abilities fully to the team's purpose. Contributes oneself. Actively communicates at team meetings.

4. Creative and energetic. Acts as an energy source, not a sink. Brings energy to the team. Conveys a sense of excitement about being part of the team. Has a can do attitude about the team's task. Has creative energy and helps spark the creative efforts of everyone else.

5. Personality. Contributes positively to the team environment and personality. Has positive attitudes and encourages others. Acts as a peacemaker if conflicts arise. Helps the team reach consensus and make good decisions. Creates a team environment that is productive and fun. Brings out the best in the other team members.



GROWTH STAGES OF A TEAM

Simply forming teams to solve problems may seem like a good idea, given the evidence and cases from the previous section, but teams are not a panacea. Teams require nurturing. Successful team development is a process. Whether in a corporate, academic, or any other setting, all teams must pass through several developmental phases before they truly become productive. These stages are forming, storming, norming, performing, and adjourning. Unfortunately, successfully completing the first four stages and becoming a productive, performing team is not guaranteed. Many teams, in practice, never reach the performing stage; they remain mired in the forming, storming, or norming stages. Every team's challenge is to grow through these stages and achieve performance.

VOCABULARY

Cajole (v): to persuade by flattery or promises; wheedle; coax.	Panacea (n): an answer or solution for all problems or difficulties.
Adjourn or Adjourning (v): to suspend the meeting of (a club, legislature, committee, etc.) to a future time, another place, or indefinitely.	

STAGE 1: *Forming*

The first stage of team development is forming. In this stage, typical dialogue may consist of the following: "Nice to meet you. Yeah, I'm not sure why we are here either. I'm afraid this might be a lot of work." In the formation stage, team members get acquainted with one another, with the leader (or they choose a leader if one is not pre-appointed), with the team's purpose, and with the overall level of commitment (workload) required. Team members learn one another's personalities, abilities, and talents and one another's weaknesses and idiosyncrasies. Individual team members are typically shy, reserved, self-conscious, and uncertain. The leader's role in this stage is to lead team ice-breaker activities, facilitate discussion, and encourage everyone to speak while quieting some who might dominate the conversation. Another role is to focus the team on the task at hand.

STAGE 2: *Storming*

The second stage of team development is storming. In this stage, typical dialogue (or private thoughts) may consist of the following: "Do I have to work with this team? What did I do to deserve this? There clearly are no super-heroes on this team, including that dizzy leader. How are we supposed to solve this messy problem?" During the storming stage, the enormity and complexity of the task begins to sink in, possibly sobering and discouraging the participants. "We are supposed to do what? By when?" Teams are rarely formed to solve easy problems, only difficult and complex ones. Typically, time schedules are short, and budgets are inadequate. Complicating the issue is that teammates have learned enough about their fellow team members to know they have no super-heroes, no saviors they can count on to do it all. (One person doing all the work is a team failure.)



Some team members may not initially hit it off well with the others. Cliques or factions may emerge within the team, pitted against other. Since the leader's weaknesses (all leaders have weaknesses) are by now apparent, some individuals or factions may vie for team leadership. Though possibly under siege, the leader's role is critical during the storming stage. The leader must focus the team on its collective strengths, not its weaknesses, and direct their energies toward the task. To be a successful team, team members do not have to like one another or to be friends. A professional knows how to work productively with individuals with widely differing backgrounds and personalities. Everyone must learn constructive dialogue and compromise.

VOCABULARY	
Enormity (n): greatness of size, scope, extent, or influence; immensity.	Sober or Sobering (v): to make or become quiet or sedate in demeanor.
Clique (n): a small, exclusive group of people; coterie; set.	Vie (v): to strive in competition or rivalry with another; contend for superiority.

STAGE 3: *Norming*

The third stage of team development is norming. In this stage, typical dialogue (or private thoughts) may consist of the following: "I think we can do it. True, we have no super-heroes, not by a long shot, but once we stopped fighting and started listening to one another, we discovered we had good ideas. Now if we can just pull these together. . . ." Norms are shared expectations or rules of conduct. All groups have some kinds of norms, though many times unstated.

Do you recall a time you joined a group or team and felt a subtle influence to act, dress, look, speak, or work in a particular way? The more a team works together, the more it tends to converge toward some common perspectives and behaviors. During the norming stage, team members begin to accept one another instead of complaining and competing. Rather than focusing on weaknesses and personality differences, they acknowledge and utilize one another's strengths. Individual team members find their place in the group and do their part. Instead of directing energies toward fighting itself, the team directs its collective energy toward the task. The key to this shift of focus is a collective decision to behave in a professional way, to agree upon and adhere to norms. Possible norms include working cooperatively as a team rather than individually, agreeing on the effort level expected of everyone, conducting effective discussions and meetings, making effective team decisions, and learning to criticize one another's ideas without attacking the person. One commanded norm is that all team members are expected to be at all meetings, or to communicate clearly in the event that they cannot attend.



During the norming stage, feelings of closeness, interdependence, unity, and cooperation develop among the team. The primary role of the leader during the norming phase is to facilitate the cohesion process. Some team members will lag behind the team core in embracing norms. The leader and others on the team must nudge individuals toward group accountability and a task focus (at this stage leadership is beginning to emerge from others on the team as well).

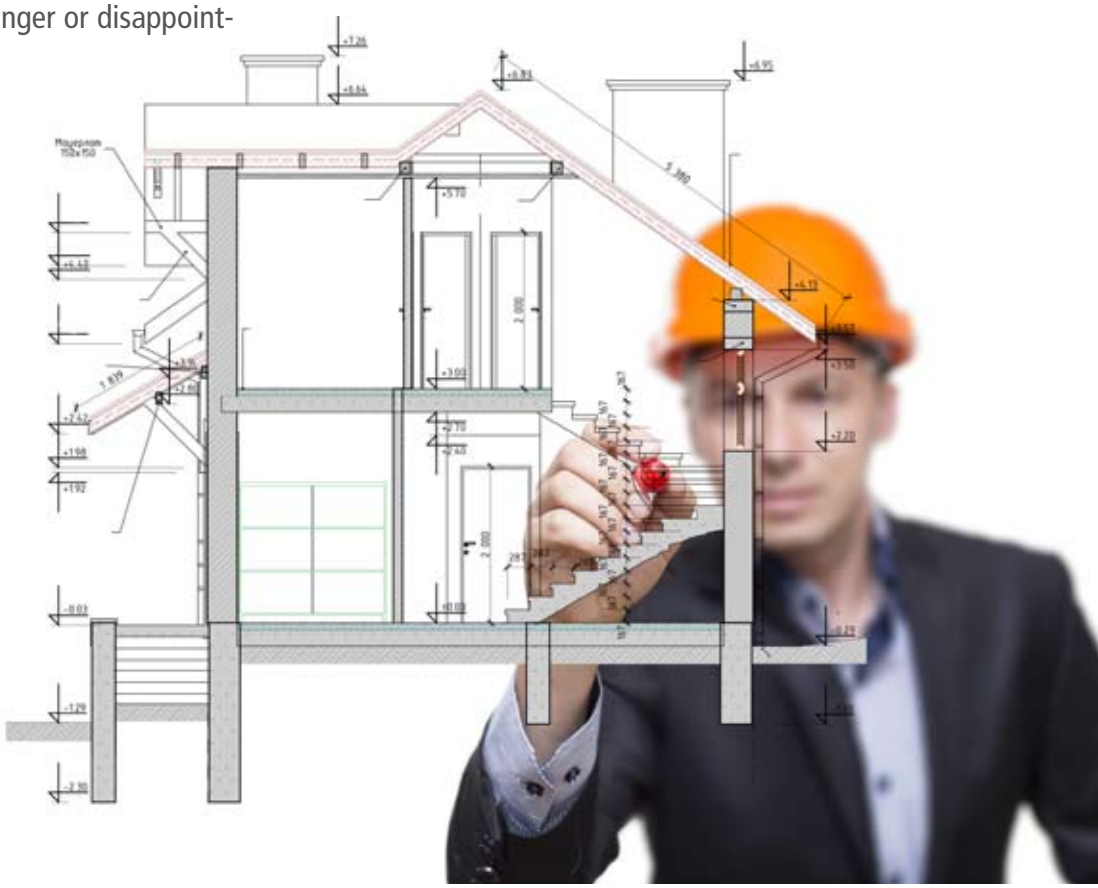
STAGE 4: *Performing*

The fourth stage of team development is performing. In this stage, typical dialogue (or private thoughts) may consist of the following: "This is a fun team. We have a long way to go, but we have a great plan. Everyone is pulling together and working hard. No super-heroes, but we're a super team." In this stage, teams accomplish a great deal. They have a shared vision. Responsibilities are distributed. Individual team members accept and execute their specific tasks according to the planned schedule. They are individually committed, and hold one another accountable. On the other hand, the roles blur. Team members pitch in to help one another doing whatever it takes to make the team successful. In a performing team, so many team members have taken such significant responsibility for the team's success that the spotlight is rarely on a single leader. Typically, whoever initially led the team becomes indistinguishable from the rest of the team.

STAGE 5: *Adjourning*

The fifth and final stage of team development is adjourning. Because teams are typically assembled for a specific purpose or project, the time comes when the team disbands and it has accomplished the goal. If the team was successful, it will have a feeling of accomplishment, even euphoria. On the other hand, an under performing team will typically feel anger or disappointment upon adjournment.

These stages, originally set forth by Bruce W. Tuckman (1965), appear in most books, which discuss teams. Some leave off the final step, adjourning. Others switch the order and present the steps as forming, conforming (instead of norming), storming, and performing.



TEAM LEADERSHIP STRUCTURES

Traditional Model

Occasionally, engineering design teams are asked to create an organizational chart. Preparing this chart gives the team the opportunity to define roles and to give thought to the relationship between the team and the team leader. Most student teams, in part because they do not know any better, default to a traditional team structure. This structure is easy to imagine, but it may or may not represent the best team operation. It implies a strong leader who largely directs the actions of the group, possibly with little participation or discussion from team members. It suggests separation between the leader and the other team members.

Participative Model

The second typical structure emphasizes a participative leadership/team model in which the leader is positioned closely to all members, with short, direct communication paths. The figure implies direct accountability of the leader to all members and dependence of the leader on their participation.

Flat Model

A third structure differs from the second because it emphasizes the leader's role as a working team member. It suggests a flat structure where the leader is an equal, rather than a hierarchical structure with the leader above the team. For this structure, it is easy to visualize the leadership function shifting around the ring of members as situations require the individual members' expertise.



VOCABULARY

Hierarchical (adj): of, belonging to, or characteristic of a hierarchy.	Hierarchy (n): an organized body of ecclesiastical officials in successive ranks or orders.

Consultant Model

The fourth structure shows the relationship between a student team and its instructor. The student team may be a design group, a research team, or a collaborative study unit. The instructor, though not part of the team, will be nearby and will serve as an important team resource. He may advise the team on administrative issues, act as a technical consultant, or assist in intervention or disciplinary action for a non-performing team member. All teams—in industry, in universities, and in private organizations—operate under the leader's or administrator's authority.

There is no one right structure. None of these structures is inherently good or bad. Examining these team structure examples gives the team the opportunity to define roles and to give thought to the relationship between the team and the team leader. A team needs to choose a structure that effectively models how it wants to behave. The ultimate success of the team hinges upon the team and its leader(s) working together to accomplish the team's purpose. As a team works, they may find that their operational structure may shift periodically in response to different situations and challenges.



HOW EFFECTIVE TEAMS WORK

Every team makes decisions in order to accomplish its work. The ability to make high-quality decisions in a timely manner is a mark of a great team. The process of how decisions are made affects the quality of these decisions. Unfortunately, most teams arrive at decisions without even knowing how they did it. In this section, we present many ways in which decisions are made and discuss their advantages and disadvantages. Though we recommend teams decide in advance what decision-making process they will use, the best teams use many decision making means depending on the circumstances. The following classification of decision-making is summarized from, *Why Teams Do not Work*, by Harvey Robbins and Michael Finley (1995).

VOCABULARY

Intervention (n): interposition or interference of one state in the affairs of another.

MODES OF TEAM ACTION

Consensus:
A decision by consensus is a decision in which all the team members find common ground. It does not necessarily mean a unanimous vote, but it does mean that everyone has an opportunity to express their views and to hear the views of others. The process of open sharing of ideas often leads to better, more creative solutions. Unfortunately, achieving consensus can take time and become unwieldy for larger teams.

Majority:
Another way to make a decision is by majority vote. The option that receives the most votes wins. The advantage here is that it takes less time than reaching consensus. Its disadvantage is that it provides for less creative dialogue than consensus, and the minority, who lose the vote, may become alienated.

Minority:
Sometimes a small subset of the team—a subcommittee, for example—makes the decision. The advantage here is that it may expedite the decision. The disadvantage is that team communication is less, and some team members may be prevented from contributing to the decision.

Averaging:
Averaging is compromise in its worst form. It's the way Congress and some committees arrive at decisions. Averaging is often accomplished with haggling, bargaining, cajoling, and manipulating. No one is happy except the moderates. The advantage of averaging is that the extreme opinions tend to cancel one another out. The disadvantages are that there is little productive discussion (as in consensus), and that the least informed can cancel the votes of the more knowledgeable.



Expert:
When facing a difficult decision, expertise is always best. If an expert is on the team, he or she may be asked to make a decision. If a team lacks an expert, which is often the case, the best teams recognize this and seek expert advice. The advantage of this is that the decision is made with accurate, expert knowledge. The disadvantage is that experts who, with the same information, will disagree on the best course of action. How can a team know the expert has given them the best advice? Additionally, team members may be divided on which expert to consult, as well as on their assessment of the expert's credentials.

VOCABULARY	
Consensus (n): majority of opinion.	Unanimous (adj): of one mind; in complete agreement; agreed.
Haggle (v): to bargain in a petty, quibbling, and often contentious manner.	

Authority Rule without Discussion:
This occurs when a strong leader makes decisions without discussing the details with or seeking team advice. This works well with small decisions, particularly of an administrative nature, with decisions that must be made quickly, and with decisions the team is not well qualified to contribute to. Of the many disadvantages, the greatest is that the team's trust in its leader will be undermined. The team members will perceive that the leader doesn't trust and is circumventing them. If one person is continually making all the decisions, or if the team is abrogating its responsibility to act together and, by default, forcing the decision onto an individual, then this is a group, not a team. It is a loose aggregation of individuals, a dysfunctional team.

Authority Rule with Discussion:
This can be an effective way of decision making. One person, the leader or a delegated decision maker, makes the final decision but the leader first seeks team input. The team meets and discusses the issue. Many, but perhaps not all, air their viewpoints. Now, more fully informed, the appointed individual makes the decision. The advantage of this method is that the team members, being part of the process, feel valued. They are more likely to be committed to the result. This type of decision-making process requires a leader and a team with excellent communication skills and a leader who is willing to make decisions.



GETTING GOING IN A TEAM SETTING

If you have an opportunity to become part of a team, how should you approach it? What should your attitudes be?

1. Determine to give your best to help the team grow and accomplish its purpose. Do not just tolerate the team experience.

2. Do not expect to have perfect teammates. You are not perfect; neither are they. Do not fret that your friends are not on your team. Make friends with those on your team.

VOCABULARY

Circumvent (v): to avoid (defeat, failure, unpleasantness, etc.) by artfulness or deception; avoid by anticipating or outwitting.

3. Be careful about first team impressions. Some team members may seem to know all the right things to say, but you may never see them again. Others might at first look like losers but become the ones who attend all meetings, make steady contributions, and ensure the team's success. Be careful about selecting a leader at the first team meeting. Sometimes the person who seems to be the most qualified to lead will never make the commitment necessary to be the leader. Look for commitment.

4. Be a leader. If you are not the appointed leader, give your support to the leader and lead from your position on the team. Do not be scared off by past team experiences where the leader did all the work. Be one who encourages other leaders.

5. Help the team achieve its own identity and personality. A team is a kind of corporation, a living entity with special chemistry and personality. No team is like any other team. Every team is formed at a unique time and setting, with different people and a different purpose. Being part of a productive team that sparkles with energy, personality, and enthusiasm is one of teamwork's rewards. Being part of a great team creates great memories.

6. Be patient. Foster team growth, and give it time to grow. Teammates are at first aliens, unsure of one another and of the team's purpose. Watch for and help the team grow through the stages of Forming, Storming, Norming, and Performing.

7. Evaluate and grade yourself and your team's performance. Document its successes and failures. Dedicate yourself to be the one who understands the team and who acts as a catalyst, i.e., one who helps the team perform at a high level. Record team experiences in your portfolio, especially times when you took a leadership role. Prepare to communicate these experiences to prospective employers.



THE CHARACTER OF A LEADER

Every successful human endeavor involving collective action requires leadership. Great teams need great leadership. Without leadership, humans tend to drift apart, act alone, and lose purpose. They may work on the same project, but their efforts, without synchronization and coordination, interfere with rather than build on one another. Without coordinated direction, people become discouraged, frustrations build, and conflicts ensue. Money is wasted, time schedules deteriorate, but the greatest loss is that of human potential. A failed team effort leaves a bitter taste not easily forgotten. Incomparably sweet, on the other hand, is the thrill of team success.

Leader Attributes:

Leaders ensure that the team remains focused on its purpose and that it develops and maintains a positive team personality. They challenge and lead the team to high performance and professionalism. With one hand they build the team, with the other they build the project. In support of these objectives, leaders must do the following:



1. Focus the team on its purpose.
2. Be a team builder. Leaders may actively work on some project tasks themselves, but their most important task is the team, not the project. They build, equip, and coordinate the team efforts so it can accomplish its purpose and succeed.
3. Plan well and utilize resources (people, time, money) effectively. Leaders effectively assess and use team member abilities.
4. Run effective meetings. They ensure that the team meets together regularly and that meetings are productive.
5. Communicate effectively. Leaders communicate the team vision and purpose. They praise good work and improve substandard performance.

VOCABULARY

Endeavor (n): a strenuous effort; attempt.

6. Promote team harmony by fostering a positive environment. If team members focus on one another's strengths instead of weaknesses, conflicts are less likely. Conflict is not necessarily evil, however. The effective leader must not be afraid of conflict. He or she should view conflicts as an opportunity to improve team performance and personality and to refocus it on its purpose.
7. Foster high levels of performance, creativity, and professionalism. Have a high vision. Challenge team members to do the impossible, to think creatively, and to stimulate one another to high performance.



Every team needs all the leadership it can get. Most teams have a single voted or appointed leader. In the best teams, however, many members contribute leadership in ways that support and complement the appointed leader. Like the appointed leader, every member should focus on the team's purpose, build the team, plan, recognize the gifts of others, contribute to effective meetings, communicate well, promote a harmonious environment, and be creative. Every member, together with the leader, should build the team with one hand and labor on the project with the other hand. Noted author John Maxwell defines leadership as influence. Every team member, from his or her team position, can influence the team's performance. It is possible to have an outstanding leader yet have the team fail if the team chooses to avoid following the leader, to undermine the leader, and to promote team disunity. Conversely, a team with a relatively weak appointed leader can be greatly successfully if the team members pitch in and build the team. The entire team, the members and the appointed leader, must work together to build a great team. It takes teamwork to make a great team.

Leadership Styles:

According to John Schermerhorn, author of Management (1996), "Leadership style is a recurring pattern of behaviors exhibited by a leader." It is the tendency of a leader to act or to relate to people in a particular way. Two categories of leadership style are task-oriented leaders and people-oriented leaders. Task-oriented leaders are concerned about the team's purpose and task at hand. They like to plan the schedule, define the work, assign the task responsibilities, set clear work standards, urge task completion, and monitor results. Peopleoriented leaders are warm and supportive toward team members, develop team rapport, respect their followers' feelings, are sensitive to followers' needs, and show trust in followers.

You may wonder whether one leadership style is better than another. A successful team needs both styles of leadership in some proportion. Earlier we stated a team has a purpose and a personality. The team must be task-oriented, but it must cultivate a team personality and a positive environment in which team performance can flourish. So, the individual team members must provide leadership that complements the appointed leader's command. If the appointed leader tends to be more task-oriented, the team can balance this with a people-orientation. If the appointed leader is people-oriented, he will likely need individuals on the team to assist with the task management details. The best leaders welcome complementary team leadership.

TEAM GRADING AND REPORTS



The primary aim of this chapter has been to give you tools and insights to increase the likelihood that you will be part of (and an active leader in) a great team. You likely will be involved in many teams during your school, in your professional life, and in volunteer capacities. Teams are everywhere, but few know how to make teams work. For teams, Voltaire's words are applicable: "Common sense is not so common." If you work hard to be sensible about teams, you will increase your value to an employer. Approach every team experience as a learning opportunity and grow as a team member and leader. An excellent way to gain the most benefit is to evaluate each team experience. Some suggested dimensions for evaluating teams are as follows:

VOCABULARY

Task-oriented (adj): focusing on the completion of particular tasks as a measure of success.

1. Did the team accomplish its purpose? Did it get the job done?

2. Did it do the job well? Were the results of high quality? If not, why?

3. Did the team grow through all of the developmental stages (Forming, Storming, Norming, Performing)? Were there any detours?

4. Reflect on the team's personality. Did the team enjoy working together? Did team members inspire one another to greater creativity and energy?

5. Evaluate team members on a report card like the one shown in Figure 13.2.

6. Evaluate the team leader(s). Was he or she an effective leader? Why or why not? How could he or she be more effective?

7. Honestly evaluate your contribution to the team.

TEAM MEMBER REPORT CARD					
Criteria	*Team Member*				
	AHMAD	GEORGE	JAIME	JOE	SARAH
1. Attendance: Attends all team meetings, arriving on-time or early. Dependable, faithful, reliable.					
2. Responsible: Gladly accepts work and gets it done. Spirit of excellence.					
3. Has abilities the team needs. Makes the most of abilities. Gives fully, doesn't hold back. Communicates.					
4. Creative. Energetic. Brings energy, excitement to team. "CAN DO" attitude. Sparks creativity in others					
5. Personality: Positive attitudes, encourages others. Seeks consensus. Fun. Brings out best in others. Peace-maker. Water, not gasoline, on fires.					
AVERAGE GRADE:					
GRADE SCALE: 5 - Always; 4 - Mostly; 3 - Sometimes; 2 - Rarely; 1 - Never					

TABLE 13.2 Sample team member report card

In addition to learning more about teams, another reason to document team performance is to inform your instructor (when you are in school) or your supervisor (when at work) about the team's work. All teams have a supervisor. It is important that you report data to the instructor or supervisor. Some argue that student team members should each get the same grade, and in general, this is the best practice. But students should know from the start that if they do not participate in a significant way in the team's work, then their instructor may adjust the grade downward. In order for the instructor to make such determinations, he or she needs quantitative information on team member contributions (at midterm and at the end of the semester). Sometimes instructors ask team members to grade one another, but the reason for the grades remains unclear. The act of team members evaluating one another on team success criteria gives concrete evidence for team member grades. These criteria are more valuable to the team if they are held up as a target or goal at the beginning of the team activity. The team must understand these criteria will be the basis for the evaluation. In addition to the team member report card, the following should be valuable to your instructor:



1. Attendance records for all team meetings (usually weekly). Who attended? Was anyone habitually late or absent?

2. Actual contributions of each member. Include a table like the one presented in Figure 13.2 in the final report noting the each individual's contribution for each of the team's major projects and assignments. Add these percentages in order to quantify a team member's total contribution. Variation is expected in the members' contributions because balancing effort precisely is impossible. In the example in Fig. 13.3, four members' contributions varied from 95 to 155 percent. Also included in the table (a sign of a healthy team) is that each of the four active team members took a leadership role on at least one aspect of the project effort: Sally took primary lead on the final report, George led in the creation of the Instruction Manual, Ahmad led in the CADKEY Drawings and the PowerPoint presentation, and Jaime led in the project construction. Though their contribution percentages vary, little evidence exists that anyone's grades should be adjusted downward. They each deserve the team grade. Joe, on the other hand, contributed nothing, and deserves a grade penalty. Chances are, the 10 percent is a gift from his teammates.

TEAM MEMBER CONTRIBUTIONS ON PRIMARY SEMESTER PROJECTS						
Team Members	CADKEY Drawings	Project Construction	Instruction Manual	Final Report	Power-Point Presentation	Total Individual Contribution
SARAH	0%	15%	45%	60%	15%	135%
JOE	0%	5%	0%	5%	0%	10%
GEORGE	10%	15%	55%	15%	10%	105%
AJHMAD	75%	10%	0%	10%	60%	155%
JAIME	15%	55%	0%	10%	15%	95%
	100%	100%	100%	100%	100%	400%

TABLE 13.3 Team member contribution report

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LEARNING ACTIVITIES

ACTIVITY 13.1 *Airplane in a Box* TIME: 1 hours

CASE STUDY

When a company designs something for production, many times they are not the ones who manufacture it. Everyone, who plays a part in the development and completion of a particular product, must be on the same page to achieve maximum results. If one team player makes a mistake, or does not understand the procedures for a project, the end result may be total failure. For example, NASA lost an unmanned module landing on Mars. The failure was attributed to something basic, something that may affect the way college students study science and engineering in the future. First, the satellite was composed of materials which were not sufficiently resistant to heat. Second, the weight distribution was uneven in the satellite, causing it to wobble excessively. The major blunder, though, was that the trajectory calculations were made using American units (pounds of force) by the subcontractor, Martin Marietta, whereas NASA assumed that they were metric units (Newtons).

REFERENCES

- http://mars.jpl.nasa.gov/msp98/news/mco991110.html NASA's report on the response to the loss of the Mars Climate Orbiter and the initial findings of the mission failure investigation board.

You can see from this example that if one small piece of a project is overlooked or assumed, it can have catastrophic results.

In this case study, you will build one of the following out of one sheet of copy paper:

1. A paper airplane

2. A box

Your instructor will place you in two different rooms, or one group in the hallway and one in the classroom, to build your objects. If you are assigned to the paper airplane, please do not test your creation as this is not its intent.

LEARNING ACTIVITIES

ACTIVITY 13.2 *Precision Directions* TIME: 2–3 class periods

CASE STUDY

Oral and written communications are important between teams of people working on projects. Mistakes or misrepresentations can cause the end product to be something different than intended. Therefore, any written communication should be done with neat and clear handwriting. Examples of the effects of bad handwriting range from criminals escaping jail time because of bad penmanship by police officers to patients that receive the wrong prescriptions from pharmacists because of a doctor's poor handwriting. When communicating with others, precision and clarity are paramount.

Part A

You are responsible for developing a paper airplane prototype. Brainstorm a design for your prototype and write instructions so that someone else can replicate your design. Use one piece of paper to make your prototype airplane and one piece of paper to write the instructions on. Make sure that both pieces of paper have your name on them. Return your instructions sheet to your teacher and keep your prototype plane put away until asked to present it.

REFERENCES

- The image used in this case study is courtesy of The Ronald Reagan Library, 40 Presidential Drive, Simi Valley, CA 93065. The library's website: http://www. reagan.utexas.edu

Part B

Your instructor will provide you with a sheet of paper and a set of instructions from one of your classmates. Follow the instructions exactly to produce a paper airplane. After you complete the paper airplane from the given instructions, your teacher will ask you to find the person that originally designed the plane and wrote the instructions. Compare the model you created from the instructions to the original prototype.

Answer the following questions:

1. Does the model made from the instructions look like the original prototype? If not, what are the differences?
2. What questions did you have about the directions written to make the model?
3. What could the person who wrote the directions have done to make it easier to make the model?
4. Rewrite the instructions for the original prototype with the creator.

LEARNING ACTIVITIES

ACTIVITY 13.3 *Desert Survival* **TIME:** 1–2 class periods

CASE STUDY

A planeload of Uruguayan rugby players crashed into the Andes Mountains in 1972. Some survived but not all. As the days passed, they slowly realized that the tragedy wasn't over, and their lives depended on their ability to adapt and survive with what little they had. This is a true story. Books, articles, and movies have covered it. The books and the movies tell the story, but when it is broken down into its simplest form, it is about teamwork and problem solving. They had many more different troubles to unravel than the average person living in civilization; they had to figure out how to survive. For seventy-two days, those who survived the crash had to design their day with the next in mind. They had to work together, and work through their differences. Many engineering teams will have differences. It is human nature to fight for your own opinions and stick to your guns.

However, for a project to survive, or a group of people to survive, certain compromises have to be made. It is how a team, engineering or otherwise, goes though this process that is the valuable lesson learned.

Items	*STEP 1 Individual Rank*	*STEP 2 Team Rank*	*STEP 3 Expert Rank*	*STEP 4 Difference Between 1&3*	*STEP 5 Difference Between 2&3*
Flashlight (4 battery size)					
Jackknife					
Sectional air map of the area					
Plastic raincoat (large)					
Magnetic compass					
Compress kit with gauze					
.45 caliber Loaded pistol (loaded.45 caliber)					
Parachute (red & white)					
Bottle of salt tablets (1,000 tablets)					
1 One quart of water per person					
Book entitled, Edible animals of the desert					
Pair of sunglasses per person					
2 Two quarts of 180 proof vodka					
1 One top coat per person					
Cosmetic mirror					
			TOTALS		

The key elements in the art of working together are how to deal with change, how to deal with conflict, and how to reach our potential . . . the needs of the team are best met when we meet the needs of individual persons. (Max DePree)

You will start working individually and then come together in a team designated by your instructor to complete this case study. The situation is as follows:

At approximately 10 AM in mid-August, you have just crash landed in the Sonora Desert in southwestern United States. The light twin-engine plane containing the bodies of the pilot and co-pilot has completely burned. Only the airframe remains. None of the rest of you has been injured.

The pilot was unable to notify anyone of your position before the crash. However, he had indicated before impact that you were 70 miles from a mining camp, which is the nearest known habitation, and that you were approximately 65 miles off the course that was filed in your VFR Flight Plan.

The immediate area is quite flat and, except for occasional barrel and saguaro cacti, appears to be rather barren. The last weather report indicated that the temperature would reach 100 degrees that day, which means that the temperature at ground level will be 130 degrees. You are dressed in lightweight clothing: short sleeved shirts, pants, socks, and street shoes. Everyone has a handkerchief. Collectively, your pockets contain $2.83 in change, $85.00 in bills, a pack of cigarettes, and a ballpoint pen.

Before the plane caught fire, your group was able to salvage the fifteen items listed above. Your team's task is to rank these items in the order of their importance to your survival, starting with a one as the most important to fifteen as the least important.

Your team may assume:

1. The number of survivors is the same number as the number on your class team.
2. You are the actual people in the situation.
3. The team must stay together.
4. All items are in good condition.

REFERENCES

- http://www.skillsusa.org/tqcpage.html
  The Total Quality Curriculum (TQC) was designed to help meet the needs of American business and industry because of changes in the global economy. The American workforce can no longer remain competitive using old methods. The TQC enhances SkillsUSA's Quality at Work movement by preparing students for the world of work.

Part A

Each member of the team is to rank each item. DO NOT discuss the situation or the survival items until each member has finished the individual ranking. You will have 15 minutes to complete the reading and the rankings.

Part B

After everyone has finished the individual ranking, rank the 15 items as a team. Once discussion begins, do not change your individual ranking. Your team will have 15 minutes to work on the collective rankings.

Add the individual scores in step four and divide the total by the number of people in your group. This is your team score. Compare that number with the total number in step five. Was your group ranking close to the team score?

LEARNING ACTIVITIES

ACTIVITY 13.4 *The String and the Ring* **TIME:** 1–2 class periods

CASE STUDY

When people are a part of a team, they need to learn to trust each other to do the job. The unit works in harmony with each component contributing to the cause. For example, if you were to join a team of orange farmers in Florida, and you were originally from Wisconsin and owned an apple orchard, would some things stand in the way of your success in the orange business? More than likely, someone who has teamwork experience in one field can make the transition to another. This example can be used in different fields and provides the basic foundation for a teamwork philosophy: "Whatever you have done, whomever you have known, and however you have done things in the past, draw from those experiences to advance the team and complete your objective. In short, get it done." (Gomez, 2003)

In this case study, you will be part of team of students that has to accomplish a simple task. Move an ordinary tennis ball from the top of a one-inch section of PVC pipe that is ten inches off the ground. A set of strings will be attached to a 1.5-inch steel ring that is placed around the base of the PVC tube. Your team of students will have to work together to pick the tennis ball off the initial tube and transfer it to another tube that is at least 20 feet away. Team members may hold on to the end of the string only. If the tennis ball ever falls from the center ring, your team must place it back on the initial pipe and start over. One person should be designated to take notes on the different team ideas, the mistakes made, and the ways the team works together to accomplish the task. A short presentation to the entire class will then be completed as a debriefing.

REFERENCES

- The heart of this case study has been used by many corporations, ropes courses, and youth groups as a team building activity. It has different variations and most are applicable to the classroom.

LEARNING ACTIVITIES

ACTIVITY 13.5 *Golf Course Development* **TIME:** 10–14 class periods

CASE STUDY

Everyday our lives take us past areas that we may never see or set foot on. People relax and enjoy their time there, whether this be in a city park, a neighborhood green space, a wooded area of town, or even a golf course. The environment is something we all should all respect a little more each day. This case study's intent is to provide perspective into the area of sustainable development.

Sustainable development is defined in Caring for the Earth (IUCN, UNEP, WWF 1991) as "improving the quality of human life while living within the carrying capacity of supporting ecosystems." In this case study, three-student teams will design one hole of an 18-hole golf course. All vegetation, course required elements, and safety corridors must be strictly followed. All teams must design within the specified case study scale. Each team must establish a working relationship with the teams behind and in front of them during the course construction. For example, hole three's team must communicate with hole two's team so a concurrent design flows from two to three. The same for team four's hole. For the entire project's development, each team must not only have a working relationship within their group, but also with other teams developing solutions.

Formulate criteria for site (hole) evaluation:

- List all on-site and off-site natural and cultural factors that influence the citing of lodge, lake, sport facilities, western town, golf course development, and access roads. Make efforts to understand the prevailing winds, slope orientation and percentage, views, solar orientation, etc. Think about them in terms of their potentials and constraints for site development.

List the square feet or length-width requirements for each site (hole) development. Develop this information into bubbles of approximate sizes.

- Lay these bubbles onto approximate location and discuss their potential and constraints. Mark each bubble's desired finish elevation for future grading reference. Holistically, route the vehicular circulation, walking trails, and major drainage ways.

Required elements:

1. Final drawing of your teams specified hole to scale of 1"=100'
2. Title block and credit information
3. Written summary and labels on drawing
4. Color-coded paper model of the team's hole (scale of 1"=60')
    - Should be three dimensional
    - Should match up correctly with hole previous and hole after
    - Green for tee boxes and putting greens
    - Red, blue, and white for designated tees
        - Red for furthest forward
        - White for next set back
        - Blue for next set back
        - Black for professional distance
    - Black for hole location
    - Light blue for water hazards
    - Light brown for sand hazards
    - Brown/gray for rock hazards
5. Vegetation as needed for design (use 3D objects to scale)
6. Presentation of your model to peers

The teams should pay strict attention to the surrounding environment and if a specific site is determined, care should be taken to sustain as much of the existing nature as possible.

REFERENCES

- www.agolfarchitect.com Tony S. Ristola is a fourteen-year PGA member and former tournament and teaching professional. Before designing and supervising the construction of his own projects, he was involved in building courses for some of the most recognized names in the industry. Tony's participation and his website have been a critical part of the development of this case study.

- http://home.okstate.edu/homepages.nsf/toc/HsuHome

- Professor Paul Hsu was born in Taiwan, ROC, and was naturalized as a U.S. citizen in 1985. Professor Hsu has contributed elements from his golf course development section within his landscape architecture program. His participation with this case study brings together the artistic and technical aspects of course development. He received Bachelor of Science Degree in Geography from National Taiwan University, Master of Landscape Architecture Degree from Cornell University, and has a Ph.D. candidate in Spatial Science and Engineering at University of Maine.

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TEAMWORK EXERCISES AND ACTIVITIES

1. Some individuals consider teams to be the answer to all human and or-ga-nizational problems. Conversely, some individuals asked to partici-pate on teams think that being part of a team is a major frustration. Comment on these propositions.

2. From your perspective, is it easy or difficult for humans to work together as teams? Does it come naturally or is a lot of work involved in making a great team?

3. Describe in your own words the growth stages of a team. Give at least two examples from your own team development experiences (any will do). Have you been a part of a team that developed to a certain point and stalled? A team that progressed quickly to a productive, performing team? A team that experienced prolonged rocky periods but ultimately made it to the performing stage? Note factors that led to the success and failure of these teams.

4. With a team of three to five people, role play a sample of conversation(s) and team behaviors for each of the five team growth stages: Forming, Storming, Norming, Performing, Adjourning.

5. With a team of three to five people, role play a sample of conversation(s) and team behaviors for teams making decisions by consensus and three other decision- making methods discussed in the chapter.

6. Here are two acronyms, from unknown sources, for the word team: "Together Excellence, Apart Mediocrity," and "Together Everyone Achieves Much." These communicate the message that by working together we can achieve more than we could achieve working alone. Other quotes related to this are "The whole is greater than the sum of the parts," and "None of us is as smart as all of us." Do you believe that these statements are true? Why, or why not? Does it depend on the situation? Are some problems better suited for teams than others? Give examples.

7. Look up the word "synergy" in a college dictionary and give its basic meaning and its root meaning from the Greek. In an introductory biology textbook look up examples of "synergism." Write and briefly describe three examples of synergism from the world of biology. Discuss lessons that humans can learn from these biologically examples?

8. There are a number of historical examples of individuals who collabo-rated and accomplished what was probably impossible if they acted alone. Have you ever been part of a fruitful collaboration? If so, discuss it? Why was it fruitful? Have you been part of a failed collaboration? If so, why did it fail?