Teamwork and Problem Solving

ENGR 1181
Class 2 – Part 1
Problem: ship wreck needs cleaned up

The cruise ship Costa Concordia struck jagged rocks and sank off the coast of Italy in 2013. It is 2X the size of the Titanic. Salvage engineers wanted to remove the ship and recycle the materials. **How would you do this?**
20 months with teams working around the clock – problem solved!
Today's Learning Objectives

- After today’s class, students will be able to:
  - Understand the benefits of teamwork and problem solving.
  - Identify roles of team members.
  - Communicate effectively.
  - Apply problem solving methods.
Outline of Class Activities

1. Lecture: teamwork + problem solving
2. Introduce Team Working Agreement
3. Activities
Questions to be Answered

1. Are there really benefits to working in teams? What are the benefits?

2. Should we assign roles in our team? How do we know who is responsible for each task?

3. How can we communicate effectively with one another?

4. Are there engineering tools that might help our team?

5. Are teams useful when solving problems?
Why focus on teamwork + problem solving?
Most industry jobs require you to solve problems and have:

- Teamwork skills
- Management skills
- People Skills

No one works in a solitary bubble. Teamwork is a must (even true with monkeys & NASA engineers (video)!)
Teamwork + Problem Solving

- Many problems are better solved as teams
- Other team members may think of ideas you did not
- Broader range of possible solutions can be created
- Each team member may bring a unique skill set or expertise, which helps with idea generation
- Team members can offer ‘fresh eyes’ to help when you are stuck on a problem
## Typical Classroom Problems

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(Harper, Freuler, & Demel, 2006)
## Engineering Problems

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*Harper, Freuler, & Demel, 2006*
Should we organize our team?

Yes, definitely. Organizing your team will:

- Help you successfully meet deadlines
- Make sure no task is overlooked
- Keep meetings productive
- Give a framework of how to approach discussions
- Reduce wasted time of team members
How to organize our team?

- There is no one correct way to organize a team
- Many different roles exist - not all have to be used
- Try things out and see what works for you!
Organization Suggestion: Team Roles

- **Facilitator:** Leads and controls the meeting, ensures all members have a chance to speak

- **Recorder:** Keeps a written record of meeting discussion and team decisions

- **Referee:** Keeps the discussion on topic and on time

...What do you do if you have a 4th team member?
How to be a better team player

- Be prepared to lead some times, follow other times
- Take responsibility for your own & team’s work
- Distribute effort and responsibility equally
Be accountable to your teammates: follow through with your work!

- Keep a positive attitude about teamwork.
- Assume positive intent of your teammates' actions.
Don’t let this happen to your team!

Be a team player.

If you keep positive communication and use your Team Working Agreement as a guide, collaboration will happen!
Team Working Agreement

- Helps your team achieve success
- Sets expectations that the team has for its members
- Sets methods of conflict resolution
- It is specific to your team
- All members have input to the document
- All members need to be accountable
- It is a contract that you sign with your team
A template for the agreement is provided for you online

Meet with your team outside of class to complete it

Schedule office hours with your GTA if you have questions or concerns as you complete it

Let’s look at the template now...
Teamwork Scenario 1

A team is encountering problems with one of its members. This team member does not complete his team assignments as he agreed, he misses team meetings, and doesn’t inform other members when he is going to miss a team activity or assignment.

What should the team do?
Addressing Typical Teamwork Issues

Teamwork Scenario 2

A team is having difficulty finding a time to have face-to-face meetings, which is causing their team assignments to suffer.

What should the team do?
Problem solving is an iterative process. At any point you may need to go back to a previous step (even the beginning!) and re-work the problem.

Reworking the problem will provide a better solution than rushing through the steps. Your first solution may not be your best solution!
Problem Solving Flow Chart

- Find on website under CLASS and use for homework
1. Define

What is the problem? What are the constraints?

- Restate the problem so the goal is clearly identified
- Document what is known and unknown
- Identify and document constraints/limitations (e.g., time, materials, budget, technology, etc.)
- Document initial assumptions or estimates for values of parameters needed
2. Represent

Display the problem in a visual form so it is easier to understand:

- Sketch or Diagram
- Graph
- Flowchart
- Orthographic Drawing
2. Represent

![Diagram of a room layout with labels for bed, desk, chair, sink, and closet.]

![Graph showing income, expenses, profit, and loss.]

Performance Report
By Project
By Studio
By Company
3. Plan

- Identify underlying principles to help solve the problem (math rules, laws of physics, etc.)
- Look for similarities and differences with previously encountered problems
- Identify potential tools to be used
- If required, make additional assumptions/estimates
- Confirm that assumptions are valid (use references!)
4. Implement

Implement the plan!

- Perform a dimensional analysis: crunch the numbers & keep track of your units!
- Keep work organized and well-documented
- Display results appropriately in a well-labeled table or graph
5. Evaluate

Always evaluate your work!

- Does the solution make sense and answer the original question?
- Is the magnitude of the answer reasonable?
- Are the units correct and reasonable?
5. Evaluate

How can we verify our answer?

- Use another approach with the same variables
- Research your answer, compare to existing solutions

- What are other methods we can use?