

Lesson Plan: The Tower Challenge

Objectives

- Work as a team and apply STEM principles while creating a tower.
- Build the tallest structure using only the supplies given to you.
- Learn how engineers plan, design and build a product from its inception to its completion.

Background Information

Engineers are responsible for almost every product on the market. From cellphones, cars, computers, bridges, and pens, to apparel, appliances, and everyday items, technically trained minds are behind the products we frequently use today.

In order to become a successful engineer, one must first have the basic understanding of **STEM** principles. This includes a background in mathematics, physics and/or computer languages. But it's not enough to just know these core disciplines, one must also understand how they are applied.

Today, we are going to solve a **challenge problem** using simple materials. You will work in a team to build a freestanding tower. Towers will be judged on several criteria:

1. 30 pts – tallest structure
2. 20 pts – most creative design (as determined by the judges)
3. 30 pts – if your structure can support the weight of a golf ball
4. 20 pts – adhering to all the project constraints

When a product is developed, it takes several people working together to create a successful **prototype**. You will need to consider the best foundation for the tower to hold its weight and keep stress levels balanced to provide proper support and strength.

- Use creativity – there is not one way to build a tower. Think of all the different types of structures you've seen.
- Communicate effectively – your idea might help someone else think differently and as a team, you're all vested in the outcome.
- Be open to suggestions – collaboration can result in different ideas to make the best possible product.
- Be flexible – Engineering development is a process. When something doesn't go as planned, a STEM professional will rethink and redesign. This includes adapting to changes, working under constraints, overcome interpersonal issues, and implementing lessons learned from previous experiences.

Key Words

- **Engineer:** someone who applies scientific knowledge, mathematics and ingenuity to develop solutions to technical, societal and commercial problems.
- **STEM:** Science, Technology, Engineering, Mathematics
- **Challenge Problem:** a task or issue requiring considerable thought and application of scientific principles to overcome.
- **Prototype** – is an early sample, model, or release of a product built to test a concept or process or to act as a thing to be replicated or learned from

Pre-Experiment Question: Why is planning and design important?

Materials

- Strands of spaghetti
- Marshmallows
- 6 inches of tape
- One 8.5" x 11" sheet of paper

Procedure

1. Discuss with your group any ideas you might have to create the tower. Collaborate and combine ideas to determine the best approach.
2. Finalize the design and roles. Roles include: project manager, builders, observer (quality control). Some people may have more than one role.
3. Build the structure.
4. Judging and group debrief.

Constraints

- Each person will take a specific role in the development of the tower and only one person can touch each material.
- No more than 5 people per team.
- Teams will have 25 minutes for planning and building.
- New guidance after 10 minutes.
 - The people handling materials are not allowed to talk.
 - The project manager cannot touch any of the materials but can give instructions to the builders.
 - Non-builders can speak only to the PM, not the building team.

Questions to answer after building:

- Why do you think engineering is important to our society?
- What challenges did you face during the planning phase?
- What did you learn during the process of building your tower?
- What surprised you most during this activity?
- If you had an opportunity to redesign your tower, what would you reengineer to make it better? How would those changes help?