

LOOK, MOM! I'M ON AN ENGINEERING DESIGN TEAM

Teaching Structural Integrity and Teamwork through Design

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Skill Level

Beginner (4th/5th graders)

Educational Standards Supported

5.ETS1.1, 5.ETS1.2

Learner Outcomes

The learner will be able to:

- Demonstrate understanding of the engineering design process (EDP)
- Apply the steps of the EDP to build a structure
- Value the importance of working on a team

Tag(s)

4-H Science

Time Needed

30-45 minutes

Materials Needed (per group)

- Student Handout: Engineering Design Process
- 15 pipe cleaners per group of four students
- Tape measure or ruler

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Introduction to Content

In this lesson, students are introduced to the engineering design process. Students learn the steps in this process and then are tasked with completing a design-and-build challenge that encourages them to work as a team and to follow the steps in the process.

Introduction to Methodology

This lesson begins by students completing a self-assessment of their skills as a team member. Students are then grouped into teams of four and presented with an engineering design challenge. Student teams work to complete the challenge with some twists and turns thrown in for fun. Students then reflect on their design and offer suggestions for improvement.

Terms/Vocabulary/Concepts

Engineering Design Process - The engineering design process is a set of steps that guides engineering teams as they solve problems. The process is iterative, meaning that engineers repeat the steps as many times as needed, making improvements along the way as they learn from failure.

Setting the Stage/Opening Question

Say to the students, “Today, we are going to be working on an engineering design problem as well as building some teamwork skills. To get started, we are going to do a quick assessment of your teamwork skills. When I say one of the skills, think about how you use these skills when you work on a team and hold up a number using your fingers to show that. One finger would be you don’t have that skill at all and five means you use that skill flawlessly. Everyone clear?”

If students understand the instructions, list the following skills and have students hold up their fingers: communication, being fair, listening to others and sharing responsibility.

Say to the students, “We will come back to those answers later, so try to remember how you answered the question. By the end of today’s class, you should be able to understand and apply the steps of the engineering design process to a problem and value the importance of working as a team.”

Strategies to Increase Student Engagement

As students are completing the building activity, rotate around to each group to ensure they are following directions and working as a team. If you notice that a student isn’t engaged, find a way for them to re-engage with their group.

Experience

Group the students into teams of four and pass out the handout and 15 pipe cleaners to each group. Say to the students, “Your engineering team has been assigned an important mission. You are to build the tallest freestanding tower using only the materials I gave you. If you’ll look on the handout, you’ll be working on step 1, 2 and 3. Everyone ready? Ok. Go!”

Allow students to work for about three minutes, and then say, “Everyone stop what they’re doing! Our company has experienced an unexpected loss in resources. Because of this, everyone on your team can only work at 50 percent efficiency. That means that everyone needs to put one arm behind their back and continue working.”

Allow students to work for approximately six minutes in this fashion, and then say, “Everyone stop again! The manager of our company has realized how hard working at only 50 percent efficiency really is, so she has decided to make some changes to the way our company runs. We will be hiring all staff back, but to promote a more efficient work environment, no one is allowed to speak while on the job! So from this point on, we have to work in silence.”

Allow students to finish their structures.

Share

After students have completed their structures, rotate to each group to measure and have the team explain how they decided on their design.

Process

Ask the students the following questions. What was the hardest part of that challenge? Why? What could have made the challenge easier? Why?

Generalize

Say to the students, “Think back to the activity we did at the first of class with the teamwork skills. Do you remember your number for each skill? Thinking back to the building activity, give me a thumbs up if you think you did better than your score for each skill or a thumbs down if you think you did worse than your score.” Ask students for each of the skills: communication, being fair, listening to others and sharing responsibility. Ask the students to reflect on why they think they did better or worse in this challenge with each of the skills.

Apply

Say to the students, “Now, we wouldn’t be good engineers if we didn’t finish out the rest of the engineering design process. Take the rest of our class to work in your teams to revise your designs to improve them, and then we will measure and see whose new structure is taller. And don’t worry. There are no surprises waiting in this part of the activity.” Allow students to work in the time remaining and then measure the new structures.

Notes

Supplemental Information

Educational Standards Met

5.ETS1.1

Research, test, re-test, and communicate a design to solve a problem.

5.ETS1.2

Plan and carry out tests on one or more elements of a prototype in which variables are controlled and failure points are considered to identify which elements need to be improved. Apply the results of tests to redesign the prototype.

TIPPS ***Life Skills***

5th Grade

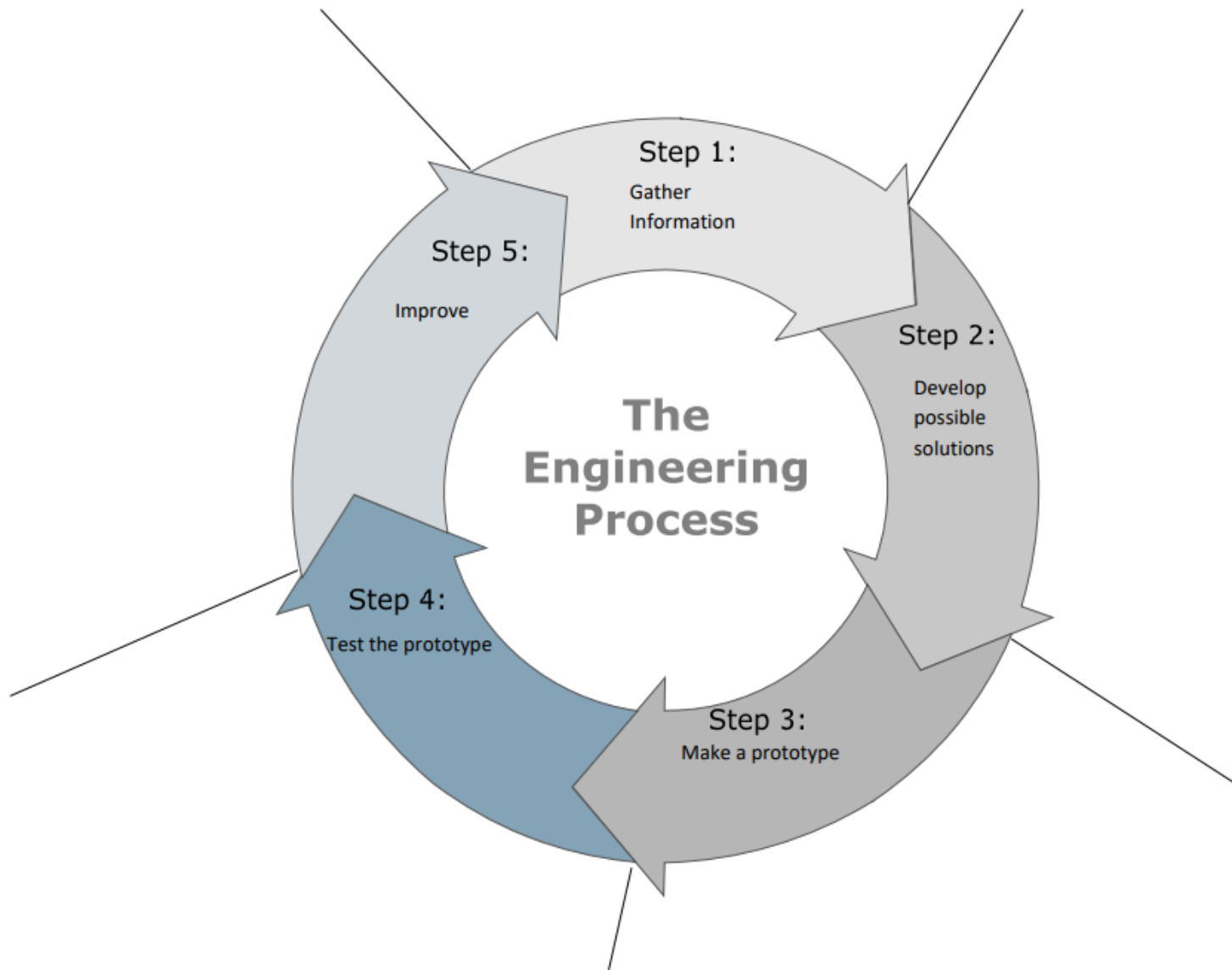
Participate in 4-H Club meetings by saying pledges, completing activities and being engaged. (Head)

Use Good Manners. (Heart)

Define issues of a given problem or situation. (Hands)

Hands – As part of a group, identify and agree on a common task or goal

Engineering Process Graphic Organizer





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