WITH THIS ACTIVITY

- Poster
- Confetti Rain Cards

MODULE
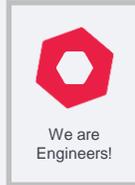
| We are Engineers! | Movement Improvement | Marvelous Materials | Smart Clothing | Patternmaking Tools n' Tech |

Big Picture

Introduce the Engineering Design Process through a challenge-based activity.

What's the goal?

Construct an umbrella that protects from an imaginary and uncommon substance falling from the sky.

Preparation

1. Plan how many teams you will have and how many young designers in each team. Teams of 3-6 work well.

2. For each team, write a design challenge onto a separate strip of paper. Fun design challenges include:

   - Green pond slime, grasshoppers, meteorites, spitballs, $100 bills, swirling dust, rotten meatballs, chocolate chips, golf balls, chipmunks, or smelly socks. Plus, whatever you imagine!

Materials

What they need: (per group)

- Few sheets of paper
- Pencils
- 1 sacrificial umbrella (thrift stores are good places to pick these up!)
- Duct tape, glue
- Scissors

What you need: (per leader)

- Regular paper
- Ladder/step stool
- Confetti
- Fishbowl/hat/bucket to draw strips of paper printed with design challenges
- Whiteboard/big sheets of paper
- Dry erase markers

Supplies to Share

- Stapler
- Hot glue gun
- Creative materials to construct the umbrella- hard and soft: bits of foam, cardboard, fabrics, glitter, streamers, yarn, party hats, take-out boxes, egg cartons, aluminum foil.

Prep Time: 15 Minutes
Activity Time: 45 Minutes
Difficulty: Level 1

3. Place team supplies on tables around the room.

4. Set up the ladder in the center of the room with enough space for all the designers to gather tightly around.

5. Display the Engineering Design Process poster in a prominent place - also on the Student Handout.

6. Remove most/all of the fabric from the sacrificial umbrellas so only the 'bones' of the umbrella remain.

Let's get started!

1. Gather the young designers closely around the base of the ladder while a leader climbs on the ladder with the confetti.

2. Explain the history of the umbrella (you can share as many of the facts below as desired) while the leader throws confetti onto the group.

    a. Say to the group: If this were a rain shower, you would want an umbrella, right? Did you know:

        i. "Umbrella" comes from the Latin word "*umbros*", which means shade or shadow.

        ii. Modern day umbrellas are very similar in their design to the models that were used in ancient Greece and Rome.

        iii. Modern day umbrellas are coated with Teflon, which makes them waterproof.

        iv. Umbrellas can be used as offensive and defensive weapons. French President Nicolas Sarkozy was the first to use Kevlar coated umbrellas as a part of his security measures.

        v. Over 33 million umbrellas are sold in United States each year.

        vi. The first waterproofed umbrellas were created in ancient China, over 3 thousand years ago.

vii.   Many Asian rulers displayed their power with multi-tiered parasols that sometimes had up to 20 levels of protection.

b. But what if umbrellas had to not only protect you from rain and the sun, but also from sticky stuff, heavy stuff, yummy stuff, or smelly stuff? How would you redesign the umbrella to protect the user from any of these crazy things? That is what we are going to explore.

c. Break into self-selected teams of __ (number of designers/team pre-determined by leader). The faster you make teams, the sooner the rain will stop!

d. OH look, the rain has stopped!

3.   Explain to the whole group.

a. Each team will have a design prompt and each team will have an old umbrella. You will modify this umbrella to solve your challenge.

b. Supplies are located on tables around the room (leaders may provide additional information about special materials).

c. You can change the umbrella and the supplies in any way you like -- cut, tape, break, add, or remove materials, as you feel necessary.

d. With your team, choose a station. You will have 5 minutes to draw and plan out your new umbrella design.

e. After the 5 minutes of planning time is up, you will have 15 minutes to construct your idea together.

4. After the design and construction time, bring the group together and ask one designer from each team to present their team's design. Have a leader write out their process on a whiteboard or on big sheets of paper. **Emphasis should be on their process not the overall product.***

a. **Engage in a dialogue with each team –** ask the "why" questions of each team:

i.   What was your umbrella supposed to protect you from?

  ii. Describe your solution

  iii. How did your team come up with this solution? Develop ideas?

 b. Leaders will help the teams realize the steps that went into solving the problem – proposing and discussing ideas, building on ideas, expanding on ideas, etc. --moving beyond the "we just thought of it" impression of the process.

5. Explain that all their processes are part of what's called the Engineering Design Process.

 a. All engineers and designers follow a process when designing a new product. (Show Engineering Design Process poster)

 b. Engineers and designers typically work using such a process but there are several different ways of working.

 c. We have adapted the EDP to the way clothing designers work. This version includes questions that you should ask when designing something new. (Go through each step).

 d. The steps of the design process are iterative (not rigid or linear). During the process, you may go back and forth among the steps and may not always follow them in order.

Wrap it Up

Ask the whole group:

1. Did your team follow these steps in the order they are presented?

2. Did you skip and combine steps?

Address the whole group: Tell the young designers that they will apply different steps of the EDP throughout the Style Engineers program.

1. As we go along, we will point out what part of the process we are in. Whether engineers are designing an umbrella or a ball gown, the Engineering Design Process guides the way.

2. Clean up time!

Challenge Prompt Example

Your umbrella has to protect you from:

Green Pond Slime

Reporters: Write down your group's **process** by answering these questions:

- How did your team redesign the umbrella to protect the user from Green Pond Slime?

- How did your team come up with this solution?