

Structural Engineer: Designing a Shelf for an Elf



Adventure Description:

In this adventure, students will think like a structural engineer and design a shelf for an elf to sit on!

Activity

Step One: Background Information on Structural Engineers (5 minutes)

- Discuss how structural engineers structures and buildings, like tunnels, buildings, bridges.
- Show [Handout: Being a Structural Engineer](#).
- Next, explain to students that structural engineers rely on lots of different kinds of support structures to make sure what they are building is safe. Explain that support structures are parts of a design that keep the structure strong so that it doesn't break when weight (like people, things, or cars) are put on it.
- Show [Handout: Types of Support Structures](#) and go through it as a class.

Step Two: Activity Set Up (5 minutes)

- Provide students with [Handout: Steps to Build a Shelf for an Elf](#). As a class, read through the steps.
- Teacher note: students can work individually or in small groups.

Step Three: Designing a Blueprint (15+ minutes)

- Teacher note: if you are short on time, you can skip this step and have students build their shelves in the next step.
- Explain to students that they will first design a blueprint of their shelf. Discuss how a blueprint is a drawing or image that shows how something will be built.
- Tip: show [Handout: Examples of Blueprints](#) so students can have an idea of what blueprints should look like.
- As students are drawing their blueprints, discuss the following:
 - What types of supports are you using in your shelf?
 - Will your shelf sit on a table or attach to a wall?

Step Four: Building a Prototype (15+ minutes)

- Explain to students that they will now build a prototype of their shelf.
- Provide students with art supplies and building materials.
 - Suggested supplies include: cardboard boxes, popsicle sticks, tape and scissors, recycled plastic containers, pipe cleaners, etc.

Please contact Allison Bischoff, Director of Teacher Support, at allison@rozzylearningcompany.com or 314-272-2560 with questions.

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- As students are building their shelves, discuss the following:
 - What design elements (e.g., beams, trusses, columns) can you add to your bridge to make sure it can hold elves of different weights?
 - What building materials will you use to make sure that your bridge is durable and won't fall apart?

Step Five: Testing the Shelf (15+ minutes)

- Explain to students that they will add different amounts of weight to their bridge! They will test whether their bridge can hold elves of different weights!
- Provide students with [Handout: Pictures of Three Elves](#).
- Explain to students that they will cut out the three elves. Then, they will tape each elf to a different object- a pencil, school glue bottle, and book. Then, they will determine whether their shelf is able to hold each of the elves.
- Have students complete the testing in step 4 of their handout. Remind students to fill in their data table as they go.

Step Six: Conclusion and Discussion (5 minutes)

- Have a students share their experiences supporting the different elves.
- Ask students the following questions:
 - Which type of support structure(s) seemed to do the best job holding up the elves? Which did the worst?
 - Why is it important for structural engineers to know what their structures will be used for? (so they can design a structure that can support the right amount of weight)
 - How does the location of a structure impact the materials that are used when building? (different materials are needed for inside versus outside, in warm temperatures vs cold, etc.)

Materials List

Provided online:

- Handout: Being a Structural Engineer
- Handout: Types of Support Structures
- Handout: Steps to Build a Shelf for an Elf
- Handout: Examples of Blueprints
- Handout: Pictures of Three Elves

Not provided (each student or group needs):

- Building supplies (cardboard, plastic containers, scrap paper)
- Tape and scissors
- School Glue Bottle
- Hardcover novel
- Pencil

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