Lesson 4 What is the Strongest Shape?

Suggested Time

One 30-minute session

Lesson Overview

Students will investigate different shapes to determine which shape is the strongest. Students will construct a roof to be placed on a previously built house. The roof must reflect their shape choice for the strongest shape. To test their structure, they will push on the top of the roof to check its strength.

- Predicting shape strengths.
- Class discussion of different building methods.
- Building a strong shape activity and testing.
- Recording design and test results in Engineering Journal.

Learning Objectives

By the end of this lesson, students will be able to:

- Determine the best shape for a sturdy roof.
- Define engineering design as the process of creating solutions to human problems through creativity and the application of math and science knowledge.

Teacher Background

Structural Strength Introduction

* info & technical terms*

Engineering Design

Engineers typically work together to solve the problems that face society. Engineering design is the process of creating solutions to human problems through creativity and the application of math and science knowledge. The basic steps within the design process include:

i. **Identifying a problem –**
   Observing a problem and seeing a need for a solution.
ii. **Researching possible solutions –**
   Coming up with ideas to address the problem.
iii. **Picking the best solution –**
   Determining which idea best addresses the problem. This decision may involve monetary, practicality, material, and property concerns.
iv. **Building a prototype –**
   Build a working model of the chosen design
v. **Testing the prototype –**
   Be sure the working model solves the problem and holds up to any important material property tests.
vi. **Repeating any steps needed to improve the design –**

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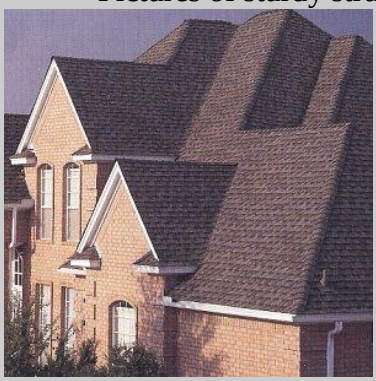
	The engineering design process is not always a step-by-step process, as engineers often repeat steps or go back and forth between the other five steps.
Vocabulary	**Engineering –** the process of creating solutions to human problems through creativity and the application of math and science knowledge. **Material –** Any substance used for constructing or making an object. A material can be a solid, liquid or a gas. **Strength –** **Shape -** ***more terms related to activity**
Materials	**For each student** - Engineer's Journal Part 1 **For each student pair** - WeDo kit **For the class** - Previously built house to test the roof's - Pictures of sturdy structures and flimsy structures  
Preparation	- Build a house without a roof for testing - Distribute Engineering Journals

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Instructions for Teachers

Constructing a Strong Roof

Activity Instructions

1. Discuss sturdiness with the students and why certain structures are sturdier than others. Show them pictures of different roof styles and how they are shaped. Ask them what kind of roof their house has.
2. Explain to students that they will be building a roof based on a shape of their choice. They must determine which shape is the best for the roof.
3. If time allows, students can also build their own house.
4. Have student pairs discuss their plan of action. Allow them 10 minutes for building and sketching.
5. Call up student pairs one at a time for roof testing. Attach the roof to the house and push down on the roof to see if it stays together. If the roof fails, have them modify their design and try again.
6. Spend five minutes at the end of the lesson discussing the sturdiness of each roof shape. Discuss any problems that students encountered and how they went about fixing them.
7. Allow time for students to record their designs and test results in their Engineering Journals.