Standard Indicator
7.1.7

Science to Build On

Purpose

Students will explain how engineers, architects, and others who engage in design and technology use scientific knowledge to solve practical problems.

Materials

For the teacher: chalk, chalkboard, meter stick, 20 cm × 25 cm piece of cardboard, plastic container, pennies
For each group of 3 to 4 students: packages of uncooked spaghetti, packages of uncooked linguini, mini-marshmallows

Activity

A. Science To Build On

1. Divide the class into groups of three to four students.
2. On the chalkboard, create a table with three columns and a row for each group of three to four students.
3. Direct each group to decide on a team name and enter those names in the table.
4. Explain that each group will be responsible for completing two different building challenges.
5. Tell students that their first challenge is to build the tallest tower in the class using only spaghetti, linguini, and mini-marshmallows. Give students some restrictions on the width of their structures, depending on how large you would like the towers to be.
6. Distribute the materials and give students a time limit within which to complete their towers. Allow students to begin construction and monitor them as they work.
7. When the time limit is up, measure each structure with a meter stick and record the height of each tower in the table on the chalkboard.
8. Determine the winning team and ask students in the group to share any building strategies they used while constructing their tower.
9. Tell students that the next challenge is to build the strongest structure in the class.

B. Strength Matters

1. Explain that the next challenge is to build a structure that will be rated on how much weight (number of pennies) it can hold. Inform students that they can use only the pasta and mini-marshmallows to build the structure.

(continued)

MEETING INDIVIDUAL NEEDS

Direct students who need an extra challenge to build a bridge out of balsa wood, following the specifications listed on this IUPUI Web site: bridge.engr.iupui.edu. Encourage students to enter IUPUI's annual bridge design competition.

EXTENDING THE ACTIVITY

Ask an engineer or architect to visit and/or take the class on a tour through town. Discuss what types of scientific knowledge are needed to build the things we see every day.

Standards Links
7.1.9, 7.1.10

Activity (continued)

2. Give students guidelines on the height and width of their structures, depending on how large you want the structures to be.
3. Inform students that the weight each structure can support will be determined by placing a piece of cardboard on top of the structure, a plastic container on top of the cardboard, and then inserting pennies into the container.
4. Give students a time limit for completing their structures.
5. When the time limit is up, assess each group's structure by counting the number of pennies it will support.
6. Record each group's results in the table and circle the winning team.
7. Ask students what strategies they used while constructing their structures.

C. Reinforcing Ideas

1. Ask and discuss questions, such as the following:
   - What variables did you consider when you started to construct your structures?
   - Can you think of any scientific research you could have done to make your structures more effective? What questions would you want to know?
   - Would researching the physical properties of the pasta and marshmallows have helped?
   - What if you had to build the structures outdoors and see which would remain standing the longest? What variables would you consider and why?
2. Explain that people who work in design and technology often use scientific knowledge to solve practical problems (e.g., architects use mathematics and physics knowledge to determine the forces walls and floors can withstand).
3. Discuss how there are many types of scientific knowledge that make it possible for engineers to build bridges and dams and architects to design skyscrapers and houses.

Classroom Assessment

Basic Concepts and Processes

At the end of the activity, ask questions, such as the following:


Do you think that engineers and architects use science every day?


What kinds of scientific knowledge might an engineer need to know when designing a dam?


Did you use any scientific knowledge when you built your structure? If so, what knowledge did you use?