

Strength of Domes

Will an eggshell break under a stack of heavy books?

Instructions

In this activity, students see how strong a dome shape can be as they witness material that seems brittle and weak holding a heavy load.

Caution: For safety, be sure to inform participants not to taste or eat any of the materials during this activity.

- 1 Take two eggs and poke a tiny hole at the narrow ends of each egg. Carefully blow out the contents of the egg from either end.
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- 2 Stick tape around the middle of each egg to prevent them from cracking, and mark the center for cutting.
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- 3 Carefully cut through the tape with a small pair of sharp scissors. You should have four half eggshells of the same height. Note: As an alternative to steps 1–3, you can carefully crack each egg in half, making sure that each half is about the same size. Pour out the contents. Then stick tape around each half of the egg to trim the uneven (or excess) shell, ensuring they are the same height.
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- 4 Remove the tape from each eggshell. Place the four half shells in a rectangle shape and slowly place a book on top of the shells.
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- 5 See how many books you can add before the eggshells crack.

Materials

PER CLASS, OR PER GROUP OF
FOUR STUDENTS:

- At least 4 raw eggs (you might break a few)
- A pen
- Tape
- Scissors or a sharp knife (to be used under adult supervision)

Heavy books



Engineering & Science Connections

-  Domes are curved structures, with no angles or corners. The dome shape is very good at spreading weight evenly in all directions so that no part of the dome has to support more weight than any other part. In this activity, the downward force of the weight of the books is transferred down evenly by the dome shape to the base that the eggshell is sitting on (the foundation).

-  Engineers make use of the strength of a dome when they design many kinds of structures, such as the US Capitol building and St. Peter's Basilica.

-  An igloo is a dome-shaped shelter built with snow blocks. It doesn't require any interior structural support. The Canadian and Greenland Inuit use igloos as temporary shelters when traveling or hunting. Igloos are also used today by adventurers and mountaineers for cold weather survival.

-  Domes are also often used for sports stadium roofs. They are a good choice because they can cover such a large space below—like a football or baseball field—without any center supports.

Guiding Questions ?

What are some things that have a dome shape? (ladybug, turtle, Volkswagen Beetle)

Why do you think an eggshell is stronger than we expect?

What other shapes are strong?

Where can you see these shapes in buildings? In nature?

Courtesy of Science Sparks

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