Spider Web

Life Science | Engineering Design Process

Engineering Challenge

Visible Elements in Photo

- A large, intricately patterned spider web with radial and concentric silk strands
- Water droplets or dewdrops clinging to the web structure
- Green leafy plant stems and branches on both sides of the web
- Dark background (foliage or soil)
- Web anchored between multiple plant structures

Reasonable Inferences

- From the radial-concentric pattern: The spider web is engineered to be lightweight yet strong enough to catch and hold prey; the geometric design distributes tension evenly across the structure.
- From the water droplets and plant anchors: The web must be flexible and sticky to retain caught moisture and insects; it must also connect securely to natural anchor points that may sway or move.
- From the exposed web in an open area: The structure needs to span gaps between plants efficiently while remaining visible enough to catch flying insects.

Engineering Task

K-2 Challenge:

Make a sticky web that catches small things like pom-poms or yarn balls. Use string or yarn to build a web pattern between two chairs or a frame. Test it by gently tossing soft balls at it to see if they stick. What shape makes the best catcher?

3-5 Challenge:

Design and build a web structure using string, yarn, or dental floss that can span a 30-centimeter gap between two anchor points (e.g., branch segments, dowels, or frames). Your web must:
- Support at least 5 small weighted objects (washers, beads, or modeling clay balls) without tearing or sagging more than 5 centimeters
- Use a radial or web-like geometric pattern to distribute weight
- Be anchored securely at a minimum of 4 points

Test your design by adding weights gradually and measure how much it sags. Redesign if it fails, and explain how your final pattern distributes tension.

EDP Phase Targeted

Ask / Define Problem

This task starts with identifying a real-world engineering challenge visible in nature: how do spiders create structures that are both strong and lightweight? The photo shows the problem (spanning gaps, holding weight, flexibility) without showing the solution already built. Students must first observe the web's properties and infer the engineering requirements before imagining their own designs.

Suggested Materials

- String, yarn, or dental floss
- Two anchor points (wooden dowels, branches, or PVC frames)
- Small weighted objects (washers, metal beads, craft foam balls, or modeling clay)
- Tape or small hooks to secure anchor points
- Ruler or measuring tape
- Optional: water spray bottle to test weight-holding with added moisture

Estimated Time

K-2: 20–30 minutes (one session: build and test)
3-5: 45–60 minutes across two sessions (Session 1: design and build; Session 2: test, measure, and redesign)

Why This Works for Teachers

This challenge directly supports NGSS ETS1.A: Defining and Delimiting Engineering Problems by asking students to identify how a natural structure solves a real engineering need (spanning gaps, distributing load, flexibility), then apply those principles to build and test their own design.