

Visible Elements in Photo



- A wooden post or pole anchored in sand/ground
- A rectangular warning sign with red and white coloring and black text reading "CAUTION DROP OFF"
- Ocean water with visible waves and whitecaps
- Clear blue sky
- A sharp drop in water depth (inferred from sign placement and wave patterns)

Reasonable Inferences

- From the sign location and ocean backdrop: There is a sudden, steep change in the ocean floor depth at this location, creating a hazard for swimmers or boats.
- From the sign's durability: The structure must withstand salt water, wind, and wave exposure without failing quickly.
- From wave patterns: Strong currents and wave action are present, suggesting the supporting post must resist lateral forces.

Engineering Task

K-2 Challenge:

"Design a Strong Warning Sign for the Beach"

Your beach needs a sign to keep people safe. Build a sign holder using sticks, straws, or paper tubes that can stand up tall and not tip over, even when you blow on it (like ocean wind). Your sign must:

- Stand taller than your hand when you stand it up
- Stay standing when you gently push it sideways
- Have a sign attached that people can read from far away

Use paper, markers, tape, and building sticks to make your solution.

3-5 Challenge:

"Engineer a Coastal Warning Sign Structure"

A beach has a dangerous underwater drop-off. Design and build a sign post structure that can:

1. Stay upright when subjected to simulated wind (use a fan or your breath directed at it for 10 seconds)
2. Support a readable sign at least 12 inches above ground level
3. Resist tipping when pushed sideways with a force equivalent to 2-3 pounds of pressure (use a hanging weight or scale)
4. Last at least 5 test cycles without structural failure

Success criteria: The sign remains vertical (within 5 degrees) after all tests, and the sign surface is visible and legible from 6 feet away.

Constraints: Your post must be no thicker than 1 inch in diameter and use only one anchoring method (buried base, weighted base, or guy-wires—pick one).

EDP Phase Targeted

Ask / Define Problem

Why this phase fits: The photo shows a real safety need (coastal hazard warning) without showing the solution process. Students must first identify why a sign is needed, what forces threaten it (wind, waves, erosion), and what failure looks like before designing. This mirrors how engineers encounter real-world infrastructure problems.

Suggested Materials

1. Wooden dowels, PVC pipes, or sturdy straws (for the post)
2. Foam board, cardboard, or laminated paper (for the sign face)
3. Sand, gravel, or a weighted bucket (for anchoring/stability)
4. Tape, string, or zip ties (for assembly and bracing)
5. Markers, paint, or printed graphics (for the warning message)

Estimated Time

- K-2: 45–60 minutes (design, build, test once)
- 3-5: 90–120 minutes across two sessions (Session 1: design & build; Session 2: test, observe failure, redesign, retest)

Why This Works for Teachers

This task directly addresses NGSS ETS1.A (defining and delimiting a design problem) and ETS1.B (developing possible solutions) by having students identify the structural and environmental constraints of a real coastal safety system, then prototype and test their solutions against those constraints.