Rain Gauge

Earth & Space Science | Engineering Design Process

Engineering Challenge

Visible Elements in Photo

- A clear plastic rain gauge mounted on a wooden post or fence
- Red measurement markings and numbers (visible increments up to 5)
- A white plastic collection base at the bottom
- Weathered wooden fence/post (brown, textured grain)
- Outdoor setting with grass, gravel, and a yellow/orange fence in the background

Reasonable Inferences

- From rain gauge design: Water needs to be collected without splashing out, spilling, or evaporating—this tells us containers must have a specific shape and opening size.
- From outdoor placement: The gauge must stay stable in wind and withstand weather exposure over time, suggesting materials need durability and weight distribution.
- From measurement markings: Accurate tracking requires clear, readable gradations—precision in calibration matters.

Engineering Task

K-2 Challenge:

Challenge: Design and build a container that catches rain water without spilling it out. Your container must:
- Have an opening at the top (at least 2 inches wide)
- Stand up straight without tipping over
- Keep water inside even when you tilt it gently

Materials to test: plastic cups, paper towel tubes, bottle caps, clay, tape.

Success check: Pour water slowly into your catcher. Does it stay in? Does it tip over when you move it?

3-5 Challenge:

Challenge: Create a rain measurement device that collects and measures rainwater with 0.5-inch accuracy.

Constraints:
- Collection container opening must be between 2–4 inches in diameter
- Gauge must stand upright without support for at least 10 minutes
- Must include a calibrated measuring scale (in inches) that can be read from the side
- Must be made from recyclable or classroom materials

Success Criteria:
- When you pour exactly 1 inch of water into it, your scale reads 1 inch (±0.25 inch tolerance)
- The device does not tip when gently bumped
- All markings are visible and legible from at least 12 inches away

EDP Phase Targeted

Ask / Define Problem

This phase fits best because the photo shows a finished solution (the working rain gauge), but students have not yet identified why such a tool is needed or what problems accurate rainfall measurement solves. Starting here invites students to ask: "Why do we need to measure rain? Who uses this data? What happens if the measurement is wrong?" This grounds the engineering work in real-world purpose before diving into design.

Suggested Materials

- Clear plastic bottles or containers (2-liter soda bottles, clear cups)
- Permanent markers or paint pens (for scale markings)
- Ruler or measuring tape
- Tape (masking, duct, or clear)
- Small rocks, sand, or clay (for ballast/stability)
- Optional: funnels, straws, labels

Estimated Time

K-2: 30–45 minutes (one session)
3-5: Two 40-minute sessions (Day 1: design & build; Day 2: test, calibrate, refine)

Why This Works for Teachers

This task directly supports NGSS ETS1.A (defining and delimiting a design problem) and ETS1.B (developing possible solutions) by having students identify that rainfall measurement requires a precise, stable container design—and then build and test solutions that meet real constraints.