

### Visible Elements in Photo



- One large, irregularly shaped rock or stone with multiple surface angles and curves
- Green grass and low vegetation surrounding the rock
- A distinct shadow cast by the rock on the grass (visible on the left side)
- Patches of lichen or algae on the rock's surface (darker discoloration)
- White gravel or crushed stone visible in the upper left corner

### Reasonable Inferences

- From the rock's irregular shape and weathered surface: The rock has been exposed to environmental forces (wind, water, temperature changes) over time, creating natural erosion patterns.
- From the shadow's position and length: The sun is at a low angle, suggesting early morning or late afternoon lighting conditions.
- From vegetation surrounding the rock: This outdoor location receives sunlight and moisture, supporting plant growth—suggesting the rock is in a landscape where water drainage and sunlight exposure matter.

### Engineering Task

#### K-2 Challenge:

Make a rock shelter for a bug or small animal using rocks, sticks, and leaves. Your shelter must have a shady spot inside where the sun can't reach. Test it by shining a flashlight on it. Does the light stay out?

#### 3-5 Challenge:

Your challenge: Build a structure using rocks (or rock-shaped materials) that creates a shaded zone on the ground where the temperature stays cooler than the open sun. Your structure must:

- Use at least 3 different surface angles (like the natural rock)
- Cast a shadow that covers at least 6 inches × 6 inches of ground
- Stay stable when tilted gently (test tipping resistance)
- Protect a thermometer from direct sunlight while allowing air flow

Success Criteria: Measure the temperature in your shadow zone vs. open ground after 10 minutes of sun exposure. Your shaded area should be at least 2°C cooler.

### EDP Phase Targeted

#### Ask / Define Problem

This photo shows a natural system (rock, shadow, weathering) where students can observe an existing problem: How does nature protect small creatures from intense sun? The irregular shape and shadow are real constraints students can mimic. Starting with "Ask" allows students to investigate why rocks cast shadows and how that matters before jumping to building solutions.

### Suggested Materials

- Rocks or clay/stone-textured craft blocks (varied sizes and shapes)
- Sticks, twigs, or craft wood pieces
- Leaves, moss, or fabric scraps (for natural authenticity)
- Thermometers (2 minimum, for comparison)
- Measuring tape or ruler
- Flashlight or phone light (for K-2 testing)
- Small toy animal or bug figure (optional, for context)

### Estimated Time

3-5 minutes: Observation and discussion of the photo's shadow  
15-20 minutes: Planning and gathering materials  
25-35 minutes: Building and testing the structure  
10 minutes: Data recording and reflection  
Total: One 45-minute session, or split into two 30-minute sessions

### Why This Works for Teachers

This task directly addresses NGSS ETS1.A: Defining and Delimiting Engineering Problems (K-5) by having students identify how natural structures solve real-world problems (thermal regulation, shelter) and then redesign solutions with measurable constraints, connecting earth science (erosion, temperature) to engineering design.