

Visible Elements in Photo



- A crab with tan/brown coloring positioned on sand
- Two prominent eye stalks (antennae-like structures) extending upward
- Multiple walking legs visible on the sand surface
- Granular sand substrate surrounding the crab
- A shallow depression or burrow entrance visible near the crab's body

Reasonable Inferences

- From burrow depression: Crabs dig and maintain underground shelters for protection from predators and harsh conditions.
 - From eye stalks & leg structure: The crab's body design allows it to sense danger and move quickly across unstable sand surfaces.
 - From sand environment: The crab must function in a loose, shifting material that offers both habitat and engineering challenge.
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Engineering Task

K-2 Challenge:

Your job is to design and build a burrow (hiding place) for a pretend sand crab using sand and other materials. Your crab home should:

- Have an opening the crab can fit through
- Keep the crab safe from a "predator" (teacher's hand swooping down)
- Stay standing for at least 30 seconds

Try different ways to pack, pile, and shape the sand. What works best?

3-5 Challenge:

A hermit crab needs a burrow that is both safe and structurally sound. Your challenge: Design and build a burrow system using sand and reinforcement materials that meets these criteria:

Success Criteria:

- Entrance hole must be between 1–2 inches in diameter
- Burrow tunnel must extend at least 4 inches into the sand without collapsing
- Structure must withstand a "wave surge" (pouring water gently over it) without the entrance caving in
- Must include at least one internal chamber (wider space inside)

Design Constraints:

- You may use sand, small pebbles, and ONE reinforcement material (straw, thin sticks, or clay)
- Total build time: 20 minutes
- Test your design, observe failures, and redesign once

EDP Phase Targeted

Ask / Define Problem

This phase fits because the photo shows a real organism solving a real environmental challenge (burrowing in unstable sand). Students begin by observing why crabs need burrows and what problems loose sand creates, then move to designing their own solution. The crab becomes a model for understanding structural engineering in natural systems.

Suggested Materials

- Sand (beach sand or play sand, 5+ lbs)
 - Water in a spray bottle or cup
 - Small pebbles or shells
 - Dried straw, toothpicks, or thin craft sticks
 - Small cardboard tubes or paper cups (to test tunnel stability)
 - Ruler or measuring tape
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Estimated Time

- K-2: 30–40 minutes (exploration + build + test)
 - 3-5: 50–70 minutes (discussion + design sketch + build + test + redesign cycle)
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Why This Works for Teachers

This task directly addresses NGSS ETS1.A (defining and delimiting engineering problems) and ETS1.B (developing possible solutions) by asking students to identify the functional requirements of a natural structure and prototype a human-designed alternative that meets the same constraints.