

### Visible Elements in Photo



- A fiddler or ghost crab on wet sand with two prominent eye stalks and claws
- Sandy beach substrate with visible burrow or hole nearby
- Damp, compacted sand (darker areas indicating moisture)
- Scattered loose sand and sediment
- Bright sunlight creating shadows (implies heat and exposure)

### Reasonable Inferences

- From the burrow visible in sand: The crab digs and maintains underground shelter to escape predators, heat, and drying conditions.
- From eye stalks and raised posture: The crab needs a shelter entrance that allows it to detect movement and threats while remaining partially protected.
- From wet/dry sand texture: The crab's habitat experiences changing moisture levels, so shelter must manage water infiltration and drainage.

### Engineering Task

#### K-2 Challenge:

You are a ghost crab! Your home is getting washed away by waves. Design and build a safe burrow using sand, pebbles, and a small container. Your burrow must:

- Have a door (opening) where you can peek out and see danger coming
- Keep water from flooding your home
- Be strong enough so it doesn't collapse when you move in and out

#### 3-5 Challenge:

Ghost crabs dig burrows to survive on the beach. Your task: Design a crab burrow system that meets these criteria:

- Entrance diameter: 2–3 cm (large enough for the crab model to enter/exit)
- Must withstand at least 5 "wave washes" (water poured gently over it) without collapsing
- Must have a water-drainage feature so the crab doesn't drown during high tide
- Burrow depth: minimum 10 cm below the surface

Test your design by flooding your model burrow with water and observing how long it stays structurally sound. Redesign and test again to improve it.

### EDP Phase Targeted

#### Ask / Define Problem

This phase fits because the photo shows a real organism solving a survival problem (shelter in a dynamic beach environment). Students observe the crab's actual solution and are asked to define the problem the crab faces (heat, predators, flooding, exposure). The need is clear from the image; students don't need to imagine a hypothetical scenario.

## Suggested Materials

- Sand (wet and dry, if possible)
- Small pebbles and shells
- Clear plastic cups or containers (to model the burrow interior)
- Drinking straws or PVC pipe sections (for entrance tunnel)
- Water pitcher or spray bottle
- Small plastic crab figurine (optional, for testing)
- Ruler (for 3–5 task)

## Estimated Time

- K-2: 45–60 minutes (includes observation, building, and one water test)
- 3-5: Two 45-minute sessions (Session 1: design, build, initial testing; Session 2: observe results, modify, retest)

## Why This Works for Teachers

This task directly addresses NGSS 3-5-ETS1-1 (define engineering problems by specifying criteria and constraints) and K-2-ETS1-1 (ask questions and imagine solutions) by grounding the design challenge in a real animal's survival need visible in the photo, making the stakes tangible and the design decisions meaningful.