

## Visible Elements in Photo



- Tan/beige sandy or sedimentary surface with visible texture and small pebbles
- A fan-shaped or radiating shell impression (fossil) embedded in the center, showing clear ridged patterns
- Small white shell fragments scattered across the surface
- Shallow depression or cavity where the fossil sits
- Cracks and variations in soil color suggesting different mineral content

## Reasonable Inferences

- From the fan-shaped fossil: This organism had a segmented or ridged structure that protected it, suggesting a design challenge around structural support through repeated patterns.
- From the embedded position & surrounding sand: Fossils form when organisms are quickly buried and compressed, implying that protection from pressure and environmental forces is a key design principle in nature.
- From scattered shell fragments: Hard materials break into pieces under stress, suggesting students might explore how to balance strength with flexibility in a protective structure.

---

## Engineering Task

### K-2 Challenge:

Design a Protective Shell Home for a Pretend Sea Creature

Make a shell for a small toy creature using only paper, clay, or sand. Your shell must:

- Have ridges or bumps like the fossil (the ridges help it stay strong)
- Protect a small object inside when you gently press on it
- Be strong enough that it doesn't fall apart when you pick it up

Test it by pressing gently on top. Does your creature stay safe inside?

**3-5 Challenge:**

## Engineer a Fossil-Inspired Protective Structure

Design and build a ridge-patterned shell structure that protects a raw egg from a 30 cm drop onto a hard surface. Your design must:

- Incorporate at least 3 radiating or repeating ridges (inspired by the fossil pattern)
- Use only natural materials (sand, soil, sticks, leaves, clay) or recyclables (newspaper, cardboard tubes)
- Weigh no more than 200 grams
- Fit within a 10 cm × 10 cm footprint

Success criteria:

- Egg remains uncracked after drop test
- Ridged pattern is visible and functional (not decorative only)
- You can explain why the ridge pattern helps protect the egg

**EDP Phase Targeted**

## Ask / Define Problem

This phase fits best because the fossil itself is a natural problem-solution: an organism developed a ridged shell structure to survive in its environment. Students start by observing the problem the ancient creature faced (needing protection in shifting sand and water) and then design their own solution inspired by nature's answer. This is biomimicry in action.

---

**Suggested Materials**

1. Clay or modeling dough – for hand-molding shell patterns and testing strength
2. Sand or potting soil – to mimic the fossil's burial environment and test protection
3. Cardboard tubes, newspaper, or packing paper – recyclable structural materials for K-5 builds
4. Sticks, grass, or dried leaves – natural materials for adding ridges and texture
5. Raw eggs (3-5 Grade challenge) – the object to be protected; provides immediate feedback

---

**Estimated Time**

- K-2: One 40–50 minute session (design, build, and one test cycle)
- 3-5: Two 45-minute sessions (Session 1: design, material gathering, and build; Session 2: testing, failure analysis, and redesign if time allows)

---

**Why This Works for Teachers**

This task directly addresses NGSS ETS1.A (Defining and Delimiting Engineering Problems) and ETS1.B (Developing Possible Solutions) by having students identify a real design constraint (protection) from a fossil example, then iterate on a structure that balances strength, material efficiency, and function—just as nature did.