

### Visible Elements in Photo



- A monarch butterfly with characteristic orange and black wings with white spots, positioned on sandy ground
- A translucent chrysalis (pupae case) attached to a dried stem or plant stalk
- Sandy/concrete surface serving as the butterfly's habitat
- The butterfly's long antennae and segmented body structure
- A natural outdoor environment with minimal shelter or vegetation

### Reasonable Inferences

- From chrysalis + butterfly: The monarch undergoes metamorphosis and needs a safe, sheltered place to transform from caterpillar to adult—this is a vulnerable stage requiring protection from predators and harsh weather.
- From sandy ground + minimal vegetation: The butterfly's natural habitat may lack adequate shelter, suggesting it seeks protected spaces (like under rocks, in crevices, or near structures) to rest and survive.
- From delicate wings + exposed location: Adult monarchs are fragile and need refuge from wind, rain, and extreme temperatures during their lifecycle.

### Engineering Task

#### K-2 Challenge:

Pretend you're a monarch butterfly that just came out of its chrysalis. Your wings are wet and delicate, and you need a safe place to rest before you can fly away. Design and build a cozy shelter using craft materials that will keep a butterfly safe from wind and rain. Your shelter should have an opening for the butterfly to go in and out, and it should be sturdy enough to stay up when you gently blow on it.

#### 3-5 Challenge:

Monarch caterpillars attach their chrysalis to plants and stems in nature, but many lose their chrysalis to predators, wind, and storms. Your challenge: Design and build a protective shelter that will hold and protect a chrysalis (represented by a small paper tube, 2 inches long) attached to a stem. Your shelter must:

- Allow the chrysalis to remain attached to the stem without detaching
- Protect the chrysalis from wind (must stay in place when you blow on it from 6 inches away)
- Allow room for the adult butterfly to emerge (have an opening or weak point)
- Be built using only natural materials (twigs, leaves, bark, dried grass) OR recycled paper and tape

Success criteria: Your shelter withstands 10 seconds of wind simulation and keeps the chrysalis secure while allowing safe exit.

### EDP Phase Targeted

#### Ask / Define Problem

This phase fits best because the photo shows a real organism in a vulnerable moment (fresh metamorphosis) without adequate shelter in its environment. Students begin by asking, "What does this butterfly need to survive?" rather than jumping to solutions. The chrysalis and exposed habitat naturally prompt problem-finding before building.

### Suggested Materials

- Paper towel tubes or small cardboard boxes (chrysalis representation)
- Twigs, small branches, dried grass, and leaves (natural option)
- Tape, glue, scissors, and recycled cardboard or newspaper (crafted option)
- Small plastic cups or containers (alternative shelter bases)
- String or wire (for attaching shelter to stems)

### Estimated Time

K-2: One 30-40 minute session (15 min. discussion + design, 15-20 min. building, 5 min. testing)

3-5: Two 40-minute sessions (Session 1: problem exploration, sketching, material gathering—30 min.; Session 2: building and wind-resistance testing—40 min.)

### Why This Works for Teachers

This task directly addresses NGSS ETS1.A (defining and delimiting engineering problems) by having students identify a real need (monarch protection during metamorphosis) and design a solution with testable constraints, all grounded in observable natural science.