Bumble Bee

Life Science | Engineering Design Process

Visible Elements in Photo

- A large bumble bee with fuzzy yellow and black body segments landing on or resting on a bright pink/magenta flower
- A flower with vibrant pink/magenta petals and yellow-red center stamens
- Blue-gray translucent wings folded against the bee's body
- Green plant stems or leaves visible around the flower edges
- Pollen (yellow dust) visible on the bee's legs and body

Reasonable Inferences

1. From wing structure – The bee's wings are delicate and must be strong enough to support the bee's heavy, fuzzy body during flight and landing on flowers, suggesting a need for lightweight yet durable wing design.
2. From pollen accumulation – The bee's hairy body is designed to collect pollen as it moves between flowers, which requires surface texture and shape that hold particles without letting them fall off immediately.
3. From flower size relative to bee – The flower must be sturdy enough to support the bee's weight while the bee accesses nectar, suggesting flowers need structural support for visiting insects.

Engineering Task

K-2 Challenge:

"Design a Landing Pad for Bees"

Bees need a safe, sturdy place to land and drink from flowers. Build a flower landing pad using paper, straws, and a small cup of water (as "nectar"). Your landing pad must:
- Be tall enough to stand on a table
- Have a flat or cup-shaped top where a toy bee (small block or figure) can rest without tipping over
- Support the bee for at least 5 seconds

How would you make it strong? What shape helps the bee land safely?

3-5 Challenge:

"Design a Pollinator-Friendly Flower Structure"

Engineers need to design a synthetic flower that attracts and safely supports bumble bees while allowing pollen transfer. Your flower model must:
- Stand 15 cm tall with a stable base that won't tip over when a 50g mass (bean bag) lands on the flower head
- Have a textured landing surface (petals or platforms) at least 5 cm wide
- Include a "pollen collection zone" (colored sand or powder sprinkled on petals) that sticks to the model bee (small fuzzy object) as it lands
- Use only biodegradable or recyclable materials (paper, fabric scraps, natural fibers, wire)

Success criteria: The flower remains upright after 3 landings, transfers visible pollen to your model bee, and uses no plastic.

EDP Phase Targeted

Ask / Define Problem

This photo shows a real need in nature: flowers must support visiting insects while insects must access pollen and nectar. Students observe the problem firsthand (bumble bee landing on a flower) and can identify constraints (delicate wings, need for grip, pollen transfer). This naturally leads to asking "How can we design a structure that works for both the flower and the bee?"

Suggested Materials

- Pipe cleaners or fuzzy craft wire (to model bee structure and texture)
- Paper cups, paper towel tubes, or rolled construction paper (flower stem and base)
- Tissue paper or crepe paper in pink, yellow, red (petals)
- Colored sand, craft glitter, or crushed chalk (pollen simulation)
- Small bean bags or washers (to simulate bee weight during testing)
- Tape, glue stick, or hot glue gun (assembly)

Estimated Time

45–60 minutes for 3-5; 30–40 minutes for K-2.

Breakdown: 5 min introduction & observation, 15–20 min planning/sketching, 15–20 min building, 10 min testing & iteration, 5 min reflection.

Why This Works for Teachers

This task directly addresses NGSS ETS1.A (Defining Engineering Problems) by asking students to identify constraints (bee weight, flower strength, pollen adhesion) and criteria (stability, texture, height) from a real biological interaction, bridging life science and engineering design.