Pollinator_waystation_3 LS4 4

Life Science | Engineering Design Process

Engineering Challenge

Visible Elements in Photo

- Multiple flowering plants (cosmos, marigolds, daisies) in shades of pink, magenta, white, orange, and purple
- Dense green foliage and stems supporting the flowers
- Bare soil and mulch visible between plants
- Flowers at varying heights and densities across the garden bed
- Mixed flower colors and petal structures (single and layered petals)

Reasonable Inferences

- Flower arrangement: This garden is intentionally planted to attract pollinators (bees, butterflies) with diverse color, shape, and bloom timing—a "waystation" designed to support insect survival during migration or seasonal gaps.
- Growth pattern: Plants are densely spaced to maximize flowering area and create shelter for insects among stems and foliage.
- Seasonal function: The variety of flower types suggests this bed blooms across multiple weeks or months, providing consistent food sources.

Engineering Task

K-2 Challenge:

"Design a Flower Garden for Hungry Bugs"

Your job: Build a small flower garden that gives bees and butterflies plenty of food and safe places to rest.

Your challenge:
- Use paper flowers (or real petals/flowers if available) in different colors: pink, orange, white, and purple
- Arrange them in soil, sand, or a tray so they stand at different heights (some tall, some short)
- Plant them close together so bugs have places to hide between the flowers
- Test: Can a toy bug crawl through your garden easily? Can it reach flowers at different levels?

Success looks like: A garden with flowers of at least 3 different colors, spaced close enough to touch, and varying in height.

3-5 Challenge:

"Engineer a Pollinator Waystation Garden"

The Problem: Pollinators (bees, butterflies) need food and shelter during migration. Your engineering goal is to design a garden bed that maximizes flower availability and insect habitat.

Design Constraints:
- Use a garden plot, large container, or sandbox no larger than 2 ft × 2 ft
- Plant or place at least 4 different flower types (colors, petal shapes, bloom times if possible)
- Arrange flowers in clusters with varying heights (12–24 inches minimum range)
- Leave gaps between plant groups for pollinator pathways
- Use mulch or soil to retain moisture and provide ground shelter

Success Criteria (Measurable):
- Garden provides at least 3 different flower colors visible from above
- Flower density allows a small toy insect to move between clusters without obstruction
- Minimum 5 flowers blooming simultaneously (or visible in a photo over time)
- At least one "shelter zone" where stems and foliage create protective depth for insects

Test & Iterate:
- Observe for one week: Do real pollinators visit? Which flowers do they prefer?
- Redesign based on data: Add more of high-traffic flowers; remove overcrowded areas.

EDP Phase Targeted

Ask / Define Problem

This photo shows a real, functioning solution to a genuine ecological need—but students haven't yet identified that need or understood what makes it work. The task begins with "What problem does this garden solve?" and "What do pollinators actually need?" before jumping to building. Students must first ask why this garden exists and what insects require, then define their own waystation design criteria based on that understanding.

Suggested Materials

1. Flower seeds or seedlings (cosmos, marigolds, zinnias, daisies) + potting soil
2. Paper or tissue flowers (if live plants unavailable for quick prototyping)
3. Mulch, sand, or potting soil for the garden bed
4. Ruler or measuring tape to track flower height and spacing
5. Observation notebook to record pollinator visits and flower preferences
6. Small toy insect or finger to test pathway accessibility (K-2 version)

Estimated Time

- K-2: 45–60 minutes (planting + testing in one session; observation optional)
- 3-5: Two 45-minute sessions (design + planting in Session 1; observation and iteration over 1–2 weeks; redesign in Session 2)

Why This Works for Teachers

This task directly addresses NGSS 3-5-ETS1-1: Define a Simple Design Problem by asking students to identify what pollinators need and then prototype a living solution that meets those criteria, bridging life science (pollination, ecosystem function) with engineering design thinking.