

## Visible Elements in Photo



- A bee (or similar pollinating insect) with visible body segments, legs, and wings
- Red/pink flower petals or flower parts surrounding the bee
- Yellow pollen visible on the bee's body and on flower structures
- Multiple small red stamens or flower reproductive parts
- Pollen grains clinging to the bee's body surface

## Reasonable Inferences

- From pollen on bee's body: Pollen sticks to the bee as it visits flowers, suggesting a need to design a structure that can efficiently collect and transfer pollen.
- From bee's body shape and hairy texture: The bee's fuzzy surface naturally collects pollen, indicating that texture matters for pickup and transfer effectiveness.
- From multiple flowers visible: Bees visit many flowers in sequence, meaning a solution must work repeatedly across multiple locations.

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## Engineering Task

### K-2 Challenge:

Design a "pollen picker" tool that helps flowers share their pollen. Your tool should have a fuzzy or sticky part that picks up yellow pollen powder from one flower and drops it on another flower. Test it by moving pollen between two flower pictures or models. Does your picker grab the pollen? Does it let go when you want it to?

### 3-5 Challenge:

Engineer a pollen transfer device that mimics how bees collect and distribute pollen. Your device must:

- Collect pollen (use flour, powder, or small beads as stand-in) from a source flower in under 10 seconds
- Transfer at least 50% of collected pollen to a target flower within 3 visits
- Work without human hands touching the pollen directly (simulate the bee's autonomous role)
- Use materials that can withstand repeated use for at least 5 collection-transfer cycles

Measure success by:  $\text{pollen mass transferred} / \text{pollen mass collected} = \text{transfer efficiency \%}$ .

## EDP Phase Targeted

### Ask / Define Problem

This photo shows a natural system (pollination) without a visible human engineering problem yet. Students should start by identifying the need: "How can we help pollen move from flower to flower effectively?" or "What would a tool need to do to work like a bee?" This observational foundation lets them understand why certain design features (fuzziness, body shape, repeated travel) matter before imagining solutions.

### Suggested Materials

- Synthetic fur, felt, or textured fabric scraps (mimics bee fuzziness)
- Flour, talcum powder, or fine beads (pollen substitute)
- Pipe cleaners, craft foam, or sponges (picker body)
- Paper flowers or flower cutouts with pollen centers
- Small containers or trays (to measure pollen collected/transferred)

### Estimated Time

- 45–60 minutes (or two 30-minute sessions)
- Session 1 (15 min): Observe photo, identify how real pollen transfer works, brainstorm picker designs
  - Session 2 (30–45 min): Build, test, measure efficiency, iterate

### Why This Works for Teachers

This task directly addresses NGSS 3-5-ETS1-1 (Define a simple design problem) by asking students to recognize that natural systems solve real problems, then engineer a human-made solution inspired by that system—reinforcing the connection between life science observation and practical engineering design.