TEACHER PREPARATION GUIDE.

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One Species, Six Vegetables

Biology | TEACHER GUIDE

Planning notes for teachers: materials, setup, expected results, and what to watch for.

Not yet classroom-tested. This is a new lab design that has not been tested in a classroom yet. Expected results, times and costs are estimates, not measured values. Run the full lab yourself before you use it with students or grade it, and adjust amounts to match your materials.

Item	Details
Unit and lessons	Unit 4: Evolution and Natural Selection. Lessons: Artificial and Sexual Selection, Natural Selection
Class time	One 50-minute period
Groups	3 to 4 students rotating through 6 stations
Cost	About $10 to $15 per class for produce
Standards	HS-LS4-2, HS-LS4-4. SEP: Analyzing and Interpreting Data; Constructing Explanations. CCC: Structure and Function; Cause and Effect.

Big Idea

Six grocery vegetables are one species shaped by artificial selection. Students use structural evidence (veins, buds, leaf scars, cut sections) to identify the selected organ, then connect artificial selection to natural selection.

Materials for One Class

Item	Amount	Notes
Broccoli, cauliflower, cabbage, kale, kohlrabi	1 of each (2 if you have more than 6 groups)	Kohlrabi with leaves still attached is best. Ask the produce department.
Brussels sprouts	About 10	A stalk of sprouts is ideal when in season.
Knife and cutting board	1	Teacher only.
Rulers and hand lenses	6 each	One set per station.

Advance Preparation

1. Cut one cabbage and two Brussels sprouts in half from top to bottom before class.
2. Leave one broccoli head out for a day or two if you want a few yellow petals to show that the buds are flowers.
3. Set up six labeled stations with the diagram from the handout.

Expected Results

See the answer key for the selection map. Broccoli and cauliflower are both immature flower clusters, which surprises many students. Kohlrabi is the hardest; point to the leaf scars on the bulb.

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What Can Go Wrong

- Trimmed kohlrabi with no leaf stalks. Draw or project a photo of a whole plant.
- Groups move too slowly. Use a visible timer for station rotations.

Misconceptions to Listen For

- "These must be different species." Ask what defines a species.
- "Farmers changed the plant's DNA on purpose." They chose parents; the variation was already there.
- "Selection always happens fast." These crops took centuries to millennia.

Differentiation and Extensions

- Support: a word bank (terminal bud, lateral bud, leaf, stem, flower bud) and a labeled photo for each station. Sentence frame: "In ___, farmers selected for a larger ___."
- Extension: link to Unit 10. These crops are close relatives of *Brassica rapa*, the Fast Plants used in the heredity lab.
- Extension: research one other crop and its wild ancestor (corn and teosinte, carrots and Queen Anne's lace).

Safety and Disposal

- No eating. Teacher does all cutting.
- Compost the produce.

Standards

This lab builds toward these NGSS performance expectations:

- **HS-LS4-2:** Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
- **HS-LS4-4:** Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

Disciplinary core ideas: LS4.B Natural Selection; LS4.C Adaptation

Science and engineering practices: Analyzing and Interpreting Data; Constructing Explanations

Crosscutting concepts: Structure and Function; Cause and Effect

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