Puzzling plants

Focus question	How are corn and soybean plants similar and different?
Learning target	Students will compare and contrast the observable characteristics between corn and soy.
Vocabulary	Monocot, dicot, taproot, brace roots, pollen, silk, flower, stem, ear, pod, nodules, tassel, kernels, soybeans, trifoliate, leaf, grass, legume

HS-LS1-2 From Molecules to Organisms: Structures and Processes

Performance expectation HS-LS1-2	**Classroom connection:** Students construct plants using paper pieces to observe similarities and differences in function between two common plants.

Science and engineering practices

Developing and Using Models	**Classroom connection:** Students will construct plant representations while working together in a group.

Disciplinary core ideas

LS1.A: Structure and Function	**Classroom connection:** Students will identify the various structures that are similar and different between the plants, identifying the functions of each.

Cross-cutting concepts

Systems and Systems Modeling	**Classroom connection:** Students will identify systems within each plant and how they interact: reproductive organs, pollination, seed production, root structures, etc.

Background

Corn is a grass native to the Americas. Soybeans are a legume native to Southeast Asia.

Corn is pollinated by wind and is typically planted in 30-inch rows. A single seed, or kernel, of corn may produce a plant which yields more than 600–800 kernels of corn per ear. Approximately 22,000 to 35,000 individual plants may be grown on an acre of land. Hybrid corn is developed to produce from one to two ears per plant.

Soybeans are self-pollinated and are typically planted in 15-inch rows. A single bean may produce a plant that will yield 50–100 pods on average, each with three seeds inside. Approximately 120,000 to 140,000 individual plants may be grown on an acre of land. Soybeans are developed to produce up to 200 pods per plant.

Soybeans and corn are the primary components of animal feed and biofuel. Corn is used for energy in feed formulations while soy provides protein. In terms of biofuels, soy is used in biodiesel and corn is used in ethanol. Corn and soy will also be found as ingredients in many packaged foods.

Prior knowledge

In order to successfully complete this activity, students should have a basic knowledge of plants and what they need to grow. They also should be able to work collaboratively to put together a complete plant from multiple pieces.

Suggested timing

One class period

Materials

- Plant puzzle pieces (one complete plant for each group of 4 students)
- Scotch tape (one roll per group)

Teacher preparation

Make enough copies of the plant puzzles as needed for class size. Before class begins, lay out pieces of the puzzle, blank side up in a large pile or spread out in the hall.

Differentiation

Other ways to connect with students with various needs:

- **Local community:** A field trip to a local farm can give students experience with actual plants and the height differences, growth habitat and other physical features that are not apparent on the 2D drawings. If a farm field is not feasible, examination of sweet corn (in season or squirrel corn (available at feed stores) and frozen edamame will allow students to see differences in the seeds that are harvested.
- **Students with special needs (auditory/visual/language/reading):** Pair students with varying abilities. If it is possible to visit a farm, students can experience the smell of growing corn and soy, the feel of the leaves, the heights of the plants. Reading out the ingredients on labels of common food items will raise awareness of how prevalent corn and soy products are in foods.
- **Extra Support:** Use this video after students have completed the puzzles to show some additional differences between these two crops: `youtu.be/Q60oisOesmE`
- **Extensions:** Students may investigate other crops (tomatoes, potatoes, strawberries, blueberries, rice, wheat, sorghum, rye, clover, alfalfa) that are grown in their local areas to see what the differences are in pollination, reproduction, seed dispersal, photosynthesis, movement of nutrients and water through the plant, etc.

Assessments

Rubric for assessment

Skill	Developing	Satisfactory	Exemplary
Use a model to illustrate differences between two common crops	Student was unsuccessful in working in a group to complete a model of a plant.	Student was successful in working in a group to complete a model of a plant.	Student was successful in working in a group to complete a model of a plant and identify different systems within their plant.
Identify the structures and functions within a plant	Student was unable to correctly identify the structures and their functions within a plant.	Student was able to correctly identify the structures and their functions of parts within a plant.	Student was able to correctly identify the structures and their functions of parts within a plant and describe how those parts are connected.
Identify the systems within a plant	Student was unable to name a system within the plant and describe how it worked.	Student was able to name one system within the plant and describe how it worked.	Student was able to name multiple systems within the plant and describe how it worked.

Rubric for self-assessment

Skill	Yes	No	Unsure
I completed a model with my group.			
I can identify the structures and functions of parts within corn and soy plants using the vocabulary given.			
I can identify and describe the systems within a plant and how they interact.			