Three Sisters Garden

Overview: Students will explore the benefits of companion planting by investigating the historical Native American planting of Three Sisters Gardens.

Grade Level/Range: Grades K - 5

Objective:

Students will learn about:

- the traditional Native American practice of planting beans, corn and squash together in the same plot
- how the growth habits and biology of certain plants can complement each other to form a symbiotic or mutually beneficial relationship

Time: 3 months

Materials:

- soil preparation tools (e.g., spading forks, rakes)
- measurement tools (rulers, yardsticks, or tape measures)
- sticks (to mark mound locations)
- seeds* of corn, pole beans, winter squash or pumpkins

*(Both corn and squash seeds and plants are sensitive to cold weather and need more time to grow to maturity than some other types of vegetables. Make sure to identify varieties that are best suited to your area's "frost-free" growing season.)

Background Information:

Native peoples from different parts of North America have used a wide range of agricultural techniques. Perhaps the best known is the interplanting of corn, beans, and squash – a trio often referred to as the "three sisters." Cultivating these companions in your school garden, a small patch near the building, or even a barrel, can inspire studies of Native American customs, nutrition, and folklore.

In a three sisters planting, the three partners benefit one another. Corn provides support for bean vines. Beans, like other legumes, have bacteria living on their roots that help them absorb or "fix" nitrogen from the air and convert it to a form that the bean plants can use. As the roots of bean plants decompose after the crop is harvested (or if bean leaves and stalks are turned back into the soil after harvest), some of this nitrogen becomes available for other crops to use in coming seasons. Corn, which requires a lot of nitrogen to grow, benefits most from this nitrogen boost. The large, prickly squash leaves shade the soil, preventing weed growth, and deter animal pests. The three sisters also complement each other nutritionally, providing people with sources of both starches and proteins along with diverse vitamins and minerals.

It's hardly surprising that these crops – considered by many to be special gifts from the creator – played such an important role in the agriculture and nutrition of most of the native people of the Americas. Because of the sisters' central role as "sustainers of life," a host of stories, customs, celebrations, and ceremonies are associated with them.

Advanced Preparation: Select a site that provides full sun for 6 to 8 hours a day.

Laying the Groundwork:

Introduce students to the concept of symbiotic relationships. Begin by giving them the definition of a symbiotic relationship: "the relationship between two different kinds of living things that live together and depend on each other" (Source: Merriam-Webster's Learner's Dictionary). As a class, brainstorm examples of symbiotic relationships that the students are familiar with.

Exploration: Plant a Three Sisters Garden

Each Native culture that grew the three sisters had a unique planting system. Below, we feature guidelines for one type of setup.

1. **Plan and select a site.** You'll want to plant your three sisters garden in late spring once the danger of frost has passed. Choose a site that has direct sunshine for most of the day and access to water. Once students have determined their site's dimensions, challenge them to plan their three sisters garden on paper. They can use the layout suggested below or research and try others.
2. **Prepare the soil.** First, break up and rake the soil. Next, build a mound about 12 inches high and between 18 inches and 3 feet in diameter. If you're in a dry area, flatten the top of the mound and make a shallow depression to keep water from running off. The number of mounds your students create depends on the size of your growing area. Mounds should be 3 to 4 feet apart in all directions.
3. **Plant corn.** Some gardeners suggest soaking seeds overnight before planting; other gardeners feel pre-soaking increases the chances that seeds will rot in the soil. If you choose to pre-soak seeds, limit soaking time to 24 hours maximum. (Or experiment – try both techniques and see which works better in your conditions.) Plant four to seven soaked or unsoaked corn seeds about 6 inches apart in the center of each mound. (You'll eventually thin to three or four seedlings.) Many Native people honor the tradition of giving thanks to the "Four Directions" by orienting the corn seeds to the north, south, east, and west. By doing the same, students can learn to use compasses and observe the sun's movements.
4. **Plant beans and squash.** After a week or two, when the corn is at least 4 inches high, plant six pole bean seeds in a circle about 6 inches away from the corn. (You'll eventually thin to three or four bean seedlings.) At about the same time, plant four squash or pumpkin seeds next to the mound, about a foot away from the beans, eventually thinning to one. If you are planting a large area, you can also sow the squash in separate mounds (1 foot in diameter) between every few corn and bean mounds.
5. **Consider other additions.** Consider planting other traditional crops, such as sunflowers or Jerusalem artichokes (a tuberous perennial sunflower), around at the edge of the three sisters garden. Put them on the north side so they won't shade your other plants. Potatoes, sweet potatoes, and other native crops can be planted in nearby plots. (Some of the many other indigenous plants used by native North, South, and Central Americans include melon, tobacco, chili pepper, cotton, blueberry, wild rice, and hazelnuts.) Let your students' creative juices flow as they create a unique scarecrow; a number of Native culture's gardens incorporate these familiar figures.
6. **Maintain your traditional garden.** As corn plants grow, weed gently around them and mound soil around the base of each stem for support. When the corn is knee-high and again when silks appear on the husks, "side-dress" by putting a high nitrogen fertilizer (such as a granular organic fertilizer or fish emulsion) on the soil surface near each plant. If beans aren't winding their way around the corn, youngsters can help by moving tendrils to the stalks. (Keen observers may notice a pattern in the direction in which the bean vines wind.) To allow room for corn and beans to grow, gently direct squash vines into walkways, garden edges, or between mounds. Once students observe young fruits, side-dress the squash plants with compost or a complete organic fertilizer. If you pinch off the tips of squash runners after several fruits have started to form, the plants will devote more energy to producing squash.
7. **Enjoy your harvest.** Harvest plants when they reach maturity. If possible, plan a harvest festival to celebrate a successful growing season.
8. **Save seeds (optional).**
   You may want to leave a few fruits on your plants to allow the seeds to mature and dry (seeds will not be fully mature when the fruits are ready for consumption). By saving and replanting some of the seeds from their three sisters gardens, Native cultures brought the cycle of life full circle. Your students may want to save some to replant or package and give to other gardeners. Below are some tips for gathering and preserving the seeds.

Corn

Leave several ears on the stalk until husks dry and turn brown. Remove and peel back the husks and hang them to dry, out of direct sun, for a month. Once they're dry, remove the individual kernels. Store them in an airtight container.

Beans

Leave several pods on a plant until they turn brown and brittle. Break open the pods and remove the seeds. Leave them on a flat surface or screen, out of direct sun, to air dry for a few days. Put them in an airtight, dark container protected from extreme heat and cold.

Squash

Scoop out the seeds with a spoon and rinse them with water in a colander. Follow the same instructions as listed for drying and storing beans.

(Note: If you save and replant seed from hybrid varieties or you grow more than one variety of corn or squash near enough for cross pollination between varieties to occur, the plants that grow from your saved seeds will not show all the same traits of their parent plants.)

Alternate Growing Method: Raising Three Sisters in Containers

If your growing space is limited, you can create a mini three sisters garden in an outdoor container, such as a bucket or barrel. Although students may not be able to see the crops grow to maturity, they should be able to observe the pole beans twine around the corn and the large squash leaves form a mat. To simulate this planting system, use a large container with drainage holes in the bottom and fill it with potting mix and compost. Follow the above instructions, but plant only 3 corn seeds (and thin to 1), 2 bean seeds, and 1 mini pumpkin seed. Place the container where it will receive at least six hours of sunlight (or 12 hours of grow lights) each day.

Making Connections:

Invite your keen observers to tune in to and document, in their garden or science journals, the emerging plant parts and life cycle changes that occur in your three sisters garden. They may notice the corn tassels, the husks protecting the seeds, and the silks pushing out of the tops of the ears. Some questions to inspire thought include: What color do these turn as the fruits ripen? Which way do bean vines twine? How do they hold on? What types of flowers does each sister feature? Who visits them? What happens to flowers and where do fruits come from? What do they contain? You can also have small student groups create models, drawings, or a play depicting the unfolding life stories of the three sisters.

As the three sisters grow consider challenging students to try to figure out just how each one grows up. Does growth occur from the top of the plant or from the base? Your young scientists might draw a dot on stems of corn and bean plants with a waterproof marker. Each week, they can use a ruler to measure the distance from the ground to the dot on each stem. (Since corn, a grass, grows from the bottom, the distance between the dot on the corn plant and the ground will increase over time. On bean plants, which grow from the tip, this distance should not change.)

Branching Out:

Nutrition – Native people who grew and honored the three sisters were well aware that they were nutritionally rich and complementary. Have students research the nutritional value of each of the three sisters and the benefits of eating them in combination. They should discover that corn supplies carbohydrates and a variety of important amino acids. Beans have protein, including two essential amino acids that corn lacks. Squash contributes vitamin A. Squash seeds also contain quality fats that corn and beans lack. Encourage students to learn about some of the many ways — from grinding corn to making breads — in which different native cultures prepare and eat the three sisters. Cook some traditional meals using recipes found online.

Science – Some Native cultures fertilized soil by burying a dead fish (or fish carcass) under each three sisters mound, just beneath the seeds. As the fish decomposed, it was said to provide nutrients to the growing plants. Ask students, How might you test the effectiveness of this gardening lore? They will likely want to compare mounds planted with and without a dead fish. Although you may want to allow them to pursue such an investigation, consider encouraging them to use dried fish bones (from a fish store) or liquid fish emulsion fertilizer, which are less likely to attract unwanted critters.

Literature – Explore the role and importance of the three sisters in Native cultures through stories, celebrations, and art. Native stories often use nature to teach about relationships between people and between people and the natural world. After hearing or reading authentic Native stories, students might want to create their own tales or plays based on their growing experiences. Planting rituals and harvest celebrations, which youngsters enjoy, reveal even more about the connections people had to the three sisters. Your class might also search for artistic representations of any or all of the crops in the art, music, clothing, or housing decorations of Native cultures under study.

Social Studies – 7,000 to 10,000 years ago, what we call corn (and much of the world calls maize) was merely a wild grass. Over time, Native people systematically collected seeds from the plants best suited for eating, and corn became, well, more corn-like! Today we have colorful flint corn (often called Indian corn), which is mainly used for feed; sweet corn; dent corn; flour corn; and popcorn. (Popcorn is a flint corn with small hard kernels. When they are heated, natural moisture inside turns to steam. The trapped steam builds up pressure and the kernel explodes to reveal the fluffy air-filled endosperm.) Nearly 20 percent of the world's food calories come from corn, but it also enriches our lives in a host of other ways. Consider challenging your students to scour their kitchens and conduct research to uncover some of the products we reap from corn. Cornflakes may be obvious, but consider some of these other corn-based items: corn oil, corn syrup, fuel, fertilizer, plastics, cosmetics, and alcohol.