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# K-12 Partnership Lesson Plan

# Brook Wilke

# *History and Diversity of American Crops*

# *Schoolyard habitat series*

## Overview

In this activity, students explore the world of crop history in North America. They begin by choosing a crop species that was historically grown in the Americas, studying the history and ordering bulk amounts of seeds from an heirloom variety that has been around for many years. The students use the bulk seed to run a small scale seed store where they repackage and sell seed for a profit. Students also examine the characteristics of the seed and use the schoolyard or classroom as a place to plant and examine the growth of the variety they have chosen. Plants may be maintained in the schoolyard or at students’ homes so that they can save seed to create a seed bank at the school.

**Objectives**

At the conclusion of the lesson, students will be able to:

* Provide a detailed history about a specific crop plant
* Describe the differences between currently grown crop varieties and heirloom varieties that were maintained from past societies
* Identify major crops that were domesticated in the United States
* Identify the diversity of some crop and garden plants and understand that artificial selection/evolution processes that allow for that diversity
* Conduct a small scale, student run seed business
* Start and maintain garden plants indoors
* Plant seeds and start plants in a garden outdoors
* Create a seed bank at the school

**Length of Lesson**

6 one hour sessions between February and May

**Grade Levels**

8th

**Standards covered (NGSS)**

Disciplinary Core Ideas:

* **MS-LS2-4**: construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
* **MS-LS1-5**: construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms

Cross Cutting Concepts:

* Structure and function
* Stability and change of systems

Science and Engineering Practices

* Planning and carrying out investigations
* Obtaining, evaluating, and communicating information

**Materials**

* 6 different types of heirloom seed in bulk quantities (e.g. 24 oz Hopi Blue Flour Corn, 24 oz Genuine Cornfield Beans, 24 oz Connecticut Field Pumpkin, 4 oz Heirloom Tomato Mix, 2 oz Some Like it Hot Pepper Mix, 6 oz Gourmet Blend Lettuce)
* 150 seed envelopes (small brown manila work well)
* 4 outdoor raised garden beds (4’ x 8’ work well)
* 2 seed starting trays, with approximately 150 plastic starting wells
* Seed starting potting mix (25 quart bag)
* Hand trowels
* Shovels and rakes
* Mulch for garden beds

**Background**

### Today much of the produce found on the grocery store shelves was likely grown in a different state or even a different country. During the early American history, all fruits and vegetables were all produced locally. These local plant varieties were selected for their ability to grown in the local environment (e.g. weather, pests, growing season length, etc.). Plant varieties used in today’s large-scale agricultural operations are likely to be selected for yield, ability to survive shipping long distances, and ability to perform well in the modern chemical environment. Experts disagree about the precise definition of heirloom plant varieties. However, all heirloom plant varieties are old (have typically been around for at least 50 years), are open-pollinated (i.e. pollinated by insects or the wind without human help), and are not genetically modified organisms (GMOs). In this activity, students will gain hands-on experience with several heirloom plant varieties. This provides opportunities to compare the characteristics of these plants with those students usually encounter in the grocery store. Students will also get a first-hand look into the economic costs to producing heirloom plants.

### Activities of the session

### *Class 1: crop and variety choice (February)*

1. Begin in early February with a discussion about what the students know about crops that were historically grown in the United States. For example, some of the crops natively grown in America were corn, benas, squash (gourds, pumpkins, etc.), sunflowers, peppers, and others. Many Native Americans grew a Three Sisters Garden, which contained a mixture of corn, beans, and squash, which grew well together.
2. Have the students form into six groups to do some research about historical American crops, and choose a crop and variety that is commercially available. Several seed catalogs, including De Bruyn, Fedco, Southern Exposure, Baker Creek, etc. have excellent information and sources of heirloom seed varieties, and are available online (link listed in “Resources” below).
3. Provide the students with a catalog to search through to find a variety that has historical value. Several places offer mixtures of different heirloom varieties, which are great to use for comparison of genetic diversity. Appendix 1 has a list of seeds used in 2007 at Martin Middle School.
4. Have the students fill out the worksheet (found on the “History and diversity of American crops” lesson page on the KBS GK-12 website).

*Class 2: late February*

1. After getting suggestions from the students about the crop varieties they have chosen, order enough seed in bulk quantities for the students to repackage and sell (# of seed packets depends on the time and money available, recommend starting with three seed packets per student).
2. After getting the seed, have the students carefully open the bulk packages and examine the seeds they ordered. Are the seeds similar to their drawings? Do they look like normal seeds available today?
3. Have each of the students draw a design for the front of the seed packets that they will make and sell for their crops variety.
4. Each student should be given a copy of the seed envelop template to use as a guide for designing their seed packet. Each page has two templates so that students can make two seed packet designs or use one as practice and the second one as the real seed packet. The seed template can be found the “History and diversity in American crops” lesson page on the KBS GK-12 website.
5. Designs should represent the history behind the crop variety with a picture if possible. Also include on the back of the package the crop species, variety name, days to maturity, light requirements, planting instructions (plant spacing, planting date, planting depth), school name and the original seed source.
6. Make enough copies of the finished seed packet designs before allowing the students to cut and fold their packets.
7. Seed packets can be folded easily and taped or glued on the back side to make sure the packets stay together.

*Class 3: Early march*

1. Decide as a class what the best way to sell the seeds will be. Will there be a one-time sale at the school? Will each student be responsible for selling seed individually?
2. Decide what will happen to the money made during the seed sales. How much money was spent on supplies and seed? How much money will be made from selling seed packets? How is money going to be collected by the school and who will checks be made out to?
3. Reserve enough seeds for indoor and/or outdoor planting in the schoolyard.
4. Organize seed packaging stations for each group. The groups should have already decided much seed will go into a package.
5. Package the rest of the seeds, being careful to put the same amount of seed in each package.
6. Begin to sell seeds outside of school using designated technique.
7. Provide seed purchasers with a description of how to collect seeds at the end of the year. Ask them if they would be willing to collect seeds at the end and give them back to the school for the seed bank.

*Class 4: Late March/ Early April*

1. Each group of students is responsible for starting seeds from their plants indoors to identify growth patterns and prepare for outdoor planting.
2. Organize potting soil, potting materials and greenhouse/lighting space.
3. Have the students start plants based on recommended strategies.
4. Students will need to maintain the plants afterwards by providing adequate sunlight and water. Watering every 2-3 days is ideal. Starting seeds is sometimes difficult- so consult a good seed starting reference if you are unfamiliar with this procedure.

*Class 5: April or Spring Thaw*

1. Begin planting early season crops outdoors, which would include spinach, lettuce, leafy brassicas, etc…
2. Plant the species and varieties in a manner that makes it easy to compare the diversity of plant color and growth patterns.

*Class 6: May/ Early June (optional)*

1. Use the plants that were started indoors to transplant outdoors, and plant seeds of other crops that are late seeded. This is a good time to start a Three Sisters Garden (Corn, Beans, Squash). The Three Sisters garden works best if the corn is started before the beans and squash, so they have something to grow up.
2. Mulch to prevent weeds.
3. The teacher will need to use discretion about how much planting can be done. Remember to examine how much labor is available over the spring and summer to continue growing crops.
4. An alternative is to have each of the students take home seeds/started plants to grow in their own gardens.
5. Ask students, plant purchasers and other gardeners in the community to save seeds for the school seed bank.

*Conclusion*

* Each of the class periods should have its own short conclusion about the activities of the day. A general review of everything that had happened over the course of the project is appropriate to remind the students of what they did, what they learned, and what they planted.
* An economic analyses provided by the teacher would be appropriate to help inform the students of the money they earned or lost during the seed project.
* Remind the students to save seeds over the summer if developing a long term dataset.

*Long Term Dataset*

The teacher of the 8th grade class can maintain a long term dataset including the following information:

* *Seed Bank*: the teacher in charge of the project can start a seed bank from all the different crops and varieties that were used in the different years of this project. Seeds can be saved from other varieties that are grown in student or community members’ gardens. As more and more seeds are accumulated, the variety of seeds in the seedbank will be a great resource for this particular lesson sequence.
* A yearly report including the crops and varieties studied, the tasks accomplished by the project and an economic report for the year (teacher report can be found the “History and diversity of American crops” lesson page on the KBS GK-12 lesson page).

**Resources**

* Worksheet, seed packet template, and teacher report documents can be found the “History and diversity of American crops” lesson page on the KBS GK-12 lesson page.
* DeBruyn seed store: <http://www.debruynseed.com/>
* Fedco seed store: <http://www.fedcoseeds.com/seeds/>
* Southern Exposure seed exchange: <http://www.southernexposure.com/>
* Baker Creek heirloom seeds: <http://www.rareseeds.com/>

**Assessment**

A work sheet is included on the “History and diversity of American crops” lesson page on the KBS GK-12 website.

 Final group or individual report (teacher’s choice) including;

* A paragraph about the history of your crop (species, variety, culture)
* A paragraph about the current status of your crop (seed description, small plant description, planting details (depth, timing, spacing), light requirements, original seed source, food uses for the crop, and any other information necessary)
* A paragraph about growing the crop in the greenhouse or in the schoolyard. When the how did you plant the crop? How large was it by the time school was out? What will happen to the crop over the summer? How was it different from other crops that were grown in your class? Etc.
* A paragraph about the economics of the project. As a group, how much money was spent on supplies? How much money was made from seed sales? What was the net profit or loss?

**Post-lesson Comments and Reflection**

3/13/07

We are currently undertaking this project and are just about ready to package our seeds and begin selling them. Thus far, the students have loved doing this project and the active participation levels are very high. Students are engaged in the history of their crop and love the idea of conducting a small business. As of now, I’m not sure that I would change anything and look forward to planting the seeds outside and pursuing the idea of maintaining a seed bank at the school.

**Appendix 1. Example Seed Varieties and Descriptions**

**692HB Hopi Blue Flour Corn**

(100 days) Open-pollinated. Hopi is not just for flour. It is good to eat. We “took some ears, blanched them, then cooked…and WOW! Nicely crunchy and corny and wholesome…instead of chickens eating [it], our freezer is filled with Hopi corn,” reports Dick Burnham of Talking Crow Organic Farm in western MA. Precursors of this strain have been raised continuously for 800 years on mesas of northern Arizona. Used by the Hopis to make ceremonial *piki* bread. Tall 9' plants produce large 8-10" ears with beautiful deep kernels easily ground into flour. Very drought-tolerant, with a long taproot. (Available from Fedco seeds)

**3897SH Some Like it Hot Mix**

(64-90 days) Love hot peppers but lack the space to try separate packets of each? Our blend of seed for 5-7 different kinds all in one packet is just for you. We’ll mix colors, shapes and flavors and include both open-pollinated and hybrid varieties. (Available from Fedco seeds)

**4149MO Heirloom Tomato Mix OG**

You’d love to be adventurous and try them all but you haven’t space for that many tomato plants? Or can’t make up your mind which ones to select? Here’s the solution: Skip the fuss and leave the choosing to us! We’ll mix together a bunch of varieties (all organically grown seed) in one packet. You’ll get different colors, sizes, shapes and flavors. All you’ll need is an open mind, a good sense of observation, unjaded taste buds and acute deductive faculties. Then you can figure out which ones you like and order them by name next year. (Available from Fedco seeds, single heirloom tomato strains available at Southern Exposure seed exchange and Baker Creek heirloom seeds)

**Genuine Cornfield Pole Snap Bean**

(Scotia, Striped Creaseback) 70 days. Shade tolerant and the best variety for growing with corn. [Possibly of pre-Columbian origin, this variety is one of the oldest beans cultivated by the Iroquois who used it as a corn soup bean and bread bean. In the Cayuga Iroquois dialect its name means 'wampum bean'.] Straight pods are 5 to 7 in., containing grayish buff-brown seeds with brown mottles and stripes. Best harvested before seeds fill the pods. Use for snap or green shell. Produces very well under conditions of high heat. A valuable variety for keeping the nitrogen in your corn patch. (Available from Southern Exposure seed exchange)

**1748CF Connecticut Field Pumpkin**

(115 days) *Cucurbita pepo* Also known as Big Tom. Grown for Jack O’Lanterns and stock feed, gets 15-25 lb, sometimes more. Not uniform in size or shape. Heirloom grown by Native Americans, adopted by colonists before 1700, and a staple of nineteenth century catalogs. Hirschy sold for 4¢ per packet in 1890. *Ripens for us in good years, but often we must pick green*. (Available from Fedco seeds, also available at Southern Exposure seed exchange, DeBruyn seed store, and Baker Creek heirloom seeds)

**Gourmet Blend Lettuce**

Delicious mixture of five attractive and popular loose-leaf types. Contains Oakleaf, Ruby, Salad Bowl, Lolla Rossa and Simpson. Ideal for colorful, tasty salads or and edible garnishes. (Available from DeBruyn seed store, alternative lettuce mixes available at Fedco seeds, Southern Exposure seed exchange, and Baker Creek heirloom seeds)