From Garden to Table

Rural or urban, two effective strategies that teach students about where food really comes from

By Hillary Rubenstein, Angela Calabrese Barton, Pamela Koch, and Isobel R. Contento

"Whoa! Did you just see that come out of the ground? That looks like a carrot, yo!" That cry is a familiar one in The Green Chimneys School's organic garden, as children begin to harvest the vegetables and herbs they planted in the spring. The next sentence is invariably, "Can I eat that?"

The sight of young children eagerly reaching for and eating string beans, carrots, lettuce, radishes, and even raw beets and onions is an incredibly satisfying one for a science teacher. The experience of growing food is a natural motivation for getting children to eat more healthful foods, and the process of how food is grown, harvested, and brought to the table is a mysterious one for most children. Tending a garden can make this process real and help children make connections between farmers who grow food or raise animals and the food that arrives in the stores. But, even if you don't have access to a garden, you can effectively teach this important process to students.

I share my experiences from both perspectives—as a former science teacher at a year-round rural school with a large garden plot—and now as an urban science teacher in a climate with cold winters and no access to garden plots. In both situations, I've found a way to get students excited about understanding the food system. You can too. The activities in this article are appropriate for fourth- through sixth-grade students.

Green Acres

My experiences with gardening in a rural location occurred while teaching at The Green Chimneys School in Brewster, New York. There, planning for class gardens began early in the spring, as students completed a unit on the life cycle of plants.

In our fifth- and sixth-grade classes, students learned why the Sun stays primarily in the southern half of the sky, and we drew diagrams to show the angle of the Sun in various seasons. By using a big yellow beach ball as the Sun and a globe, students modeled rotation and revolution. We showed that the tilt of the Earth on its axis, Earth's position in relation to the Sun, and our position on Earth would all affect how and what we grew. Many students were surprised to learn that sunlight does not always hit the Earth directly from above. Students used this information to determine which areas of their garden plots would receive the most sunlight.

Each class then decided which flowers, herbs, and vegetables they would like to grow in their plot. Decisions were reached through group discussions and were often centered on favorite flavors, such as spicy food. One class brainstormed types of vegetables that would have a spicy taste and decided to plant garlic, hot peppers, and radishes. Some students researched in a seed catalog which peppers were the hottest, and other students asked family members who cooked which variety of pepper they used.

Many students wanted to grow tropical fruits, such as oranges and bananas. Aside from the fact that our climate was not suitable for these plants, conversations about biomes and growing zone maps helped to explain that not all edible plants grow within one short season. Some fruits come from trees that have been growing for years. After looking at a series of U.S. weather maps collected throughout the year, students were encouraged to brainstorm what areas of our country might not have a freezing winter season, and to look for labels on their fruits and vegetables the next time they are in a grocery store to find out where these foods come from.

Then the planting planning began. Knowing the size of their plot and using spacing information given on the seed packets, the class had to decide how much room to allot for each type of plant. They also had to decide where each plant should be placed based on the amount of sunlight it needed. A typical exchange follows:

Teacher: Should sunflowers go at the front of the plot, at the southern end?

Student: Uh. No.

Teacher: OK, Why not?

Student: Because they are tall. They will block all the sunlight from the other plants.

Teacher: Right. If the Sun's light comes in at an angle from the south, it will hit only the tall sunflowers. So, where should the tallest plants go?

Student: At the back, the north.

Teacher: Great. Can we find some shorter plants for the front? Who can think of a plant that will be short enough to be planted in the front of the plot?

On a sheet of paper, students created a grid to use in the planning process. Using a scale ratio of 1 in: 1 ft, students drew a 2 ft × 8 ft plot on their papers. Then they drew a grid that divided the plot into 16 1 ft × 1 ft squares, and labeled the northern and southern ends. In each small square, students knew they could place one tomato seedling, 3 cucumber seedlings, or about 20 carrot seeds, and planned accordingly. When it was time to plant, students entered the garden armed with their plot maps. They used compasses to determine north so that they could orient their planning maps correctly.

Growing Salsa

As the summer progressed, the classes monitored weather reports and turned on irrigation drip tubes when the soil became dry. They weeded their plots after we discussed that the weeds' roots would be competing for space, nutrients, and water with those of our vegetables and flowers.

As our gardens flourished, students pulled tomatoes, peppers, and onions from their plots. After washing our hands, rinsing the vegetables, and discussing how to properly prepare a cooking work space and how to safely use a knife, we chopped and mixed our harvest. We brought out a bag of baked tortilla chips, and the students went wild! "That's it? That is how you make salsa? Salsa comes from the ground? Wow!" Students varied the spiciness of each batch by adding more or less jalapeño and voted on their favorite. When the chips ran out, students were happy to dip carrots, string beans, and lettuce leaves into their creation.

One important lesson my students learned through gardening is that a recipe does not have to be complicated and precise. Many students expressed true delight in trying out different combinations of vegetables and knowing that it is almost impossible to make a mistake. It all tasted great! Back in the classroom, students wrote

recipes for how to make salsa and traced its ingredients back to single seeds.

I found that students were making terrific connections outside of the classroom as well. Students often brought me various foods from their lunch trays to discuss whether or not they could grow that vegetable in our garden or to share a connection they had made—"this is the same as what we are growing in our garden!"

Concrete Jungles

Working at a rural school with a large garden was a true luxury. With access to that school's garden, students in my class became farmers and gardeners and began to understand how the parts of the food system work together. Later, when I moved to an urban school in a climate with cold winters—and a school with no outdoor gardening space—I still wanted my students to learn the valuable connections about where food comes from and how it gets to their table.

The Linking Food and the Environment (LiFE) Curriculum provided a good solution (see Internet Resources). LiFE was developed by educators at Columbia University's Teachers College and funded by the National Institutes of Health National Center for Research Resources Science Education Partnership Award.

The LiFE curriculum equally engages students in the food cycle, yet does not require a two-acre plot of land. Through the curriculum's three learning modules, students explore food production, how food gets from the farm to the store, the production of waste and pollution related to handling food, and how food nourishes the body. Each module is guided by a driving question, such as "How does nature provide us with food?," and ends with lessons that allow students to integrate what they have learned into action plans for making healthful and environmentally sound food choices.

The lessons in the curriculum module use the QuESTA Learning Cycle, which involves four cyclical phases:

- **Questioning,** in which students explore their prior knowledge and experiences and develop meaningful questions to guide their inquiry.
- **Experimenting/Searching,** in which students plan their own investigations to answer the questions they pose.
- **Theorizing,** in which students reflect on what they have learned to develop their own beliefs on how the world works.
- **Applying to life,** in which students apply the new constructs and processes they learned in the unit to decisions and actions they make every day.

Connecting to the Standards

This article relates to the following *National Science Education Standards* (NRC 1996):

Content Standards

Grades K–4
Standard C: Life Science
- The characteristics of organisms
- Life cycles of organisms

Grades K–8
Standard F: Science in personal and social perspectives
- Personal health

An example of a lesson from Module 1 of this curriculum follows. In this module, students learn how the Sun helps plants to grow and how plants capture energy from the Sun to make their food. This lesson is part of a larger unit in which students learn about plant parts and photosynthesis.

Plant Parts Salad

To help students make the connection of how plants grown in the ground get to their table, I teach a lesson about making a salad from the parts of a plant. The lesson asks students to investigate the question, "What parts of a plant do humans eat?" Initially, most students respond that the only parts of the plant they eat are the fruit. To build greater understanding, we first review what the parts of the plant are and their functions. On a drawing of a plant, students label each part and write its function:

- The *roots* anchor the plant to the soil and absorb water from the soil.
- The *stem* serves as the main support for the plant.
- The *leaves* collect sunlight, and this is where photosynthesis takes place.
- The *fruit* protects, nourishes, and allows for development of the seed.
- The *seed* is the part of the plant that can grow into a new plant.
- The *flowers* contain the plant's reproductive material.

What's This?

After reviewing the functions of the parts of the plant, I place a bin with a variety of commonly eaten plant parts in front of each group of students—actually the ingredients in a green salad, but I don't point that out. The plant parts in the bin include: roots (carrots—try to purchase carrots that still have

stems and leaves), stems (celery—which is technically a *petiole*—the stalk that connects the leaf to the stem—but for elementary students *stem* is okay), leaves (lettuce), fruits (cherry or grape tomatoes), flowers (broccoli florets—try to get broccoli that is past its prime so that there are some little yellow flowers opening), and seeds (sunflower).

Students are asked to come up with ideas of how they might identify a particular part of a plant. A student might write, "It looks like it grows under the soil and it branches into smaller parts, so it may be a root."

Students complete a chart in which they list each item, state the part of the plant they believe it is, and then support their idea with evidence:

Food	Part of the Plant	Evidence
Tomato	Fruit	It is fleshy, and when you open it up you can see seeds inside, so it protects the seeds.

Students work in groups to identify the plant parts. As they do so, they begin to realize that there are many parts of plants that we eat.

Science Salad

By this time, most students are wondering what we are going to do with the "parts." We talk about how each plant part grows in a garden (carrots are roots from the ground, etc.) and discuss what foods these "plant parts" are used in. At the end of our discussion, I ask students if they want to make a "science salad." Of course they do!

Before making the salad, we discuss how to create a clean and safe work space. Students rinse the food and wash their hands, and we review the rules for using a plastic knife safely. Remind students to never eat in the same area they do science experiments.

Next, students make the salad. Each group is responsible for cutting up a different type of food. Each group then combines their plant parts and then divides the salad to be eaten among their classmates. Students can add salad dressing (one group might mix up the salad dressing while others are cutting plant parts) or eat it without dressing. Before eating the salad, have the class summarize what parts of the plant they are eating.

Students are usually as eager to eat the salad as the students who grew the ingredients in their own garden. Though the students didn't grow the salad ingredients themselves, thinking about vegetables as "plant parts" is something that most students have never considered before, so the salad is exciting.

While students eat their salads, ask them to think about other foods they eat that are a part of a plant. Students can complete a worksheet or brainstorm lists to share with each other. From an earlier lesson in the module, students already know that plants use the process of photosynthesis to create their own food. Ask students to think about where the plants might store that energy (while all parts of the plant have some energy, roots, fruits, and seeds are typically higher sources of energy). Ask students to think about which foods might provide the most energy or to compare a bite of lettuce leaf to a bite of beans.

Keywords: Plants as Food
www.scilinks.org
Enter code: SC030605

Healthy Outcomes

Finally, I ask students to think about what they learned from making the salad that they might apply to their day-to-day decisions. *How did they come together as a group to determine the part of the plant? Were they surprised that they were eating so many parts of the plant?*

As an assessment, have students evaluate the various ingredients of a recent meal and determine what parts of plants they ate. Or, share a fictional scenario in which students need lots of energy to run a marathon. Ask, *Which parts of the plant should they eat the day before the race in order to gain as much energy as possible?*

One positive outcome of studying this topic is helping to eliminate students' confusion about the food cycle. Often you hear kids say that milk comes from the cooler section in a store, or that carrots come from the produce section. How that milk gets into the carton or how those carrots end up in that store is a mystery to many students. Whether discovering these connections through hands-on gardening or lessons from a well-designed curriculum, my experience shows it *is* possible to teach children about where their food comes from and how it affects their bodies. Knowing these connections is a first step in helping kids to make healthy nutritional choices. ■

Hillary Rubenstein **(hrubenstein@yahoo.com)** ***is the founding science teacher at the Williamsburg Collegiate Charter School in Brooklyn, New York. Pamela Koch is the project director, and Angela Calabrese-Barton and Isobel R. Contento are co-principal investigators of the LiFE Curriculum Project at Columbia University's Teachers College in New York City.***

Resources

National Research Council (NRC).1996. *National science education standards*. Washington, DC: National Academy Press.

Internet

LiFE Curriculum Project
www.tc.edu/life