Stalk It Up To Integrated Learning: Using Foods We Eat And Informational Texts To Learn About Plant Parts And Their Functions

By: **Rachel Wilson** and Leslie Bradbury

Abstract

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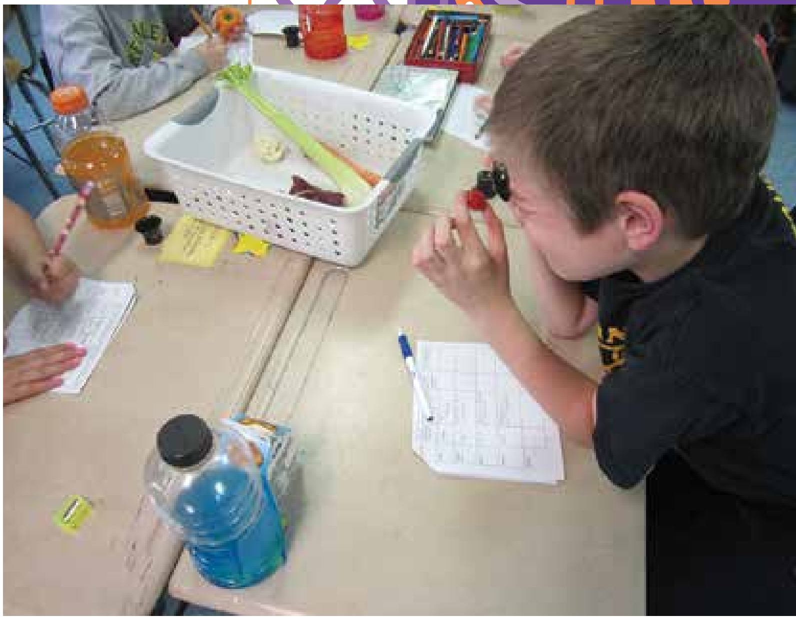
STALK IT UP TO INTEGRATED LEARNING

Using foods we eat and informational texts to learn about plant parts and their functions

By Rachel Wilson and Leslie Bradbury

The diet of many students consists of on-the-go processed food. As part of a larger school garden project, we wanted students to consider the relevance of plants in their own lives, both as food sources for us and for the animals that we eat. In this article, we present a mini-unit we taught in a third-grade classroom that helped students connect their developing ideas about plant parts with the plants we eat. This series of lessons was designed to integrate the use of informational texts into an inquiry-based science unit to meet both the *Common Core State Standards for English Language Arts* and the *Next Generation Science Standards* (*NGSS*). The classroom in which we worked is in a state that has not adopted the *NGSS*. The state's science curriculum standards address plant structure and function in third grade, whereas the *NGSS* address it in grade four.



A student examines a radish with a hand lens.

Introducing Plant Parts

A sprouting onion or a potato is an indication that plants that we eat are part of a larger plant. Though students may be used to seeing onions in the grocery store or at home, they often are seeing only the bulb, one part of a plant disconnected from the full plant that it came from. To begin our unit, we held up a sprouting onion and asked the class: "What is happening to this onion?" To focus the conversation on plant parts, we asked the students such questions as: *Is this a plant? How do you know? What parts of a plant can you see? Are there any parts missing? For the parts of the plant that you do see, what do these parts help the plant to do?* During this initial conversation, we made a list of the parts of plants that students knew on the board. The parts we were looking for were: leaf, stem, root, flower, and fruit. The students were able to name all five. Creating a list of the plant parts that students could refer to during the lesson is one way that we were scaffolding scientific language for English language learners (ELLs) in the classroom. From the discussion above, students seemed comfortable with the idea that many food plants had stems, roots, and leaves but were less sure that these plants would also have flowers and fruits.

As a preassessment, we gave students a photo of a tomato plant and asked them to label each part of the tomato plant that they could see using the list we had generated on the whiteboard. If they thought there was a part they could not see, they were to draw the missing part on the photo. The tomato plant photo had all of the parts of a tomato plant visible, except the roots. In the preassessment, most students were able to label the stems and leaves, while about half labeled the fruit and flowers, and only about one-third drew roots coming from the main stem of the plant.

After students labeled the photo of a tomato

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A student compares several types of plants humans use as food.

plant, they were ready for an investigation of other food plants. The classroom teacher split the students into groups of four. We wanted to provide students with one example of a food plant that people eat from each of the five different categories of plant parts listed in our state curriculum standards. These included cabbage (leaf), radish (root), tomato (fruit), broccoli (flower), and celery (stem). For safety reasons, send home a letter to parents before the beginning of the unit to confirm any food allergies students may have before buying your food plant examples.

CAUTION

Having students work with physical parts of food plants in cooperative learning groups is a strategy that benefits ELL students. Working with *realia*, classifying the food plants into one of the five parts listed on the board, and conversing with fellow students are strategies to develop oral scientific discourse before asking students to read or write with scientific language. These strategies benefit ELL students (Gibbons 2014) as well as students with special needs (Sorel 2003). Each group of four students received a basket with hand lenses and five food plants packaged as they would be found at the grocery store. We chose plants that came in packages with multiples for maximum cost effectiveness. The groups were given a few minutes to go through the basket to look at the examples and identify each of the plants by name. Then, each student was given a data recording sheet with the list of food plants (Table 1, see NSTA Connection).

We asked students to make observations using their hand lenses and to make predictions about what part of the whole plant each food belonged to. We modeled for the class how to do this with an asparagus spear. As a whole class, students discussed what part of the plant they thought an asparagus spear was and why, while we showed them where to fill in this information, using an example data sheet on the projector. Students went back to their small groups to work through their predictions for the five food plant examples in their basket. They only completed the first two columns of the table during this part of the lesson.

As students worked, we walked around to the groups to see their predictions and the observations they were making about the plants to use as evidence to support their predictions. Questions we asked included: *Why do you think the radish looks like a root? What do you see? What do you feel?* We encouraged them to focus on using the plant part's characteristics as evidence. In this way, we were encouraging students to make their predictions using evidence to support their argument, which is the scientific and engineering practice associated with the disciplinary core idea LS1A. This aspect of the activity also becomes an opportunity for formative assessment of student ideas about plants and their parts. Student responses gave us insight into some possible misconceptions that they had about plants we eat. Example answers focusing on characteristics of the radish included: "because the bottom looks like a string," "because it's hairy," and "because it's got a root." When we did not ask these prompting questions, students wrote down answers based on their previous experiences and observations about plants that we eat. For example, some students wrote down "fruit" for each food plant, while a couple others wrote down "vegetable" for each one, both writing "because we eat it" as their evidence.

TABLE 1.

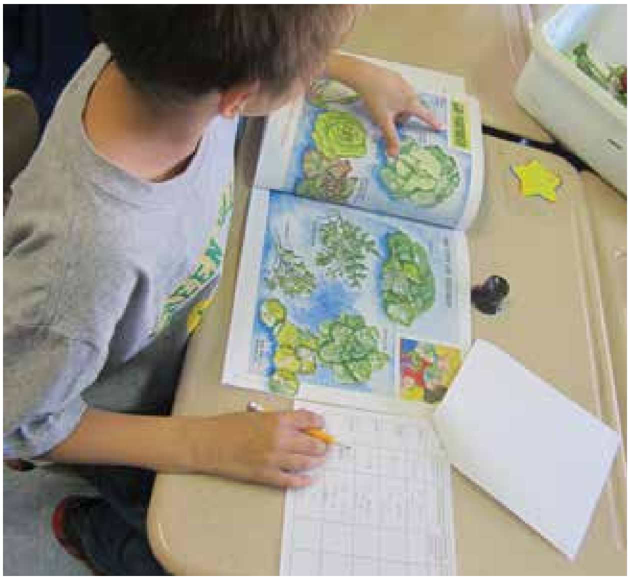
Explore data recording sheet.

Food Plant	What part of a plant do you think it is?	What evidence did you see that it is that plant part?	What plant part does your research tell you it is?	On what page did you find this information?
broccoli	leaf	It looks like stem with the leafs on tip. it is green	Flower bud	10-11
cabbage	leaf	it has the vane type stuff like a leaf. It is green	leaf	8-9
celery	Stem	it is straight and long.	stem	6-7
radish	Root	It has hairs on the bottom.	root	12-13
tomato	seed	It has seeds and it is small.	fruit	16-17

Students labeled plant parts and added missing ones.

When students had finished making their observations and predictions, we gave each group multiple copies of *The Vegetables We Eat* by Gail Gibbons (2007), to use to check their predictions. At this point in the lesson, students used the text to complete the final two columns in Table 1. Having students use an informational text to find confirmation for or corrections to their classifications addresses an English Language Arts Key Ideas and Details standard (CSS.ELA-Literacy.RI.4.1). While students were looking through the book to find information, we walked around to ask them questions about what they were reading, such as: *What are some other leaves that we eat? Looking at the broccoli now, why do you think the book says that it's a flower bud?* Then, using the example data recording sheet on the document camera, we asked the students in a whole-class discussion to tell us what they found out in their book. We reviewed the correct identification of these plants parts, as well as which examples were surprising to students and why. Students were surprised that tomatoes were considered a fruit, when they are not sweet and are called a vegetable in other contexts. Other students mentioned that they were surprised that broccoli was a cluster of flower buds because many of the students had never seen a broccoli plant in bloom. Reviewing the physical plant parts with their corresponding classifications as stems, roots, leaves, flowers, or fruits is an important reinforcement of the correct use of scientific language for ELLs (Gibbons 2014).

After a discussion of all of the examples, we asked students to go back to their labeled photos of the tomato plant from the beginning of the lesson to see if they wanted to change their answers about which parts they labeled. Relabeling their photo of the tomato plant served as a formative assessment that revealed whether students were able to correctly identify the five plant parts in one food plant example. As an alternative formative assessment for more advanced students, you could have students observe a corn cob that you bring to class, as well as a photo of a corn plant, to see if they could label all five plant parts on the photograph of a new plant.



A student digs deeper into plant anatomy.

TABLE 2.

Functions of parts of a plant.

Plant Part	Function	Characteristics
Root	absorbs water and nutrients from soil	thin, hairy-like or thick and long, below ground
Stem	provides support to plant and helps water and nutrients to travel from roots to leaves and other above-ground parts	straight, green, have round vessels inside, above ground
Leaf	absorbs sunlight and makes food for the plant	green, many different shapes, has veins/vessels in a pattern, attached to stem, above ground
Flower	attracts pollinators and collects pollen to make seeds for the plant	many shapes and colors, has structures such as petals, makes pollen, often not green
Fruit	holds seeds of the plant, helps the seeds to travel to a new place to grow	seeds can be on outside or inside of fruit; fleshy (to encourage eating) or dry, spikes (to attach to animals), feathery/wings (to fly on wind)

Digging Deeper

On day 2, we reviewed with students the parts of the plants that we had observed on day 1. Each group of six students received three copies of a book about their plant part with the task of becoming an expert on that part (see Resources). Students used a reading prompt sheet (see NSTA Connection) with questions developed using the Question–Answer–Relationship (QAR) questioning strategy (Jones and Leahy 2006) for them to answer about their plant part, thus giving them a purpose when reading their informational text. Students had previously reviewed this QAR reading strategy with their third-grade classroom teacher. In pairs, students used their book to find information about their plant part, searching for key ideas and details (CCSS.ELA-Literacy.RI.4.1) to answer the Right There and Think and Search questions. Students also needed to interpret diagrams, photographs, and text in answering the Think and Search and the Author and Me questions (CCSS.ELA-Literacy.RI.4.7). We walked around to the groups to help them make sense of the information they were reading by helping them with vocabulary words they did not know or prompting them to look more closely at photographs to help with context clues. We encouraged them to share with each other in their groups the information that they found out about their plant part in preparation to be an "expert." By reading and discussing the text in pairs in their group of six, ELLs and native speakers of varying reading abilities are able to help each other prepare for their future role as experts on their plant part and its function.

When they finished their "expert" research, the students were put into their new jigsaw groups to report the results of their informational reading. Each jigsaw group had a student who was an "expert" on leaves, another who was an "expert" on flowers, another who was an "expert" on stems, and so on. Students then shared what they had learned about their part of the plant and what it helped the plant to do. In this type of discussion, students must draw on their prepared information (CCSS.ELA-Literacy.SL.4.1.A) to communicate specific ideas about the plant parts and their function (CCSS.ELA-Literacy.SL.4.1.D).

After the jigsaw discussions, we came back together as a whole class to reinforce the functions of each plant part students had been discussing (Table 2, p. 49). In this discussion, we specifically wanted students to recognize common characteristics of the plant parts and how these might be related to their function in a plant. For example, some students noticed that radishes had "strings" or "hairs" on them. We talked about whether or not they thought all roots might have these features and how these hairs might help the root achieve its function to absorb water and nutrients from the soil. This discussion amongst the teacher and student experts was an opportunity to emphasize how each part of the plant plays an important role in the survival, growth, and, in the case of fruit and flower, reproduction (disciplinary core idea LS1A).

Further activities that could follow this mini-unit might be planting of carrot seeds to observe the plant growth over time. When observing a plant like a carrot through its life cycle, students have an opportunity to see how they might eat the root of a plant, but that plant still has a stem, leaves, flowers, and fruits. In their school garden, students had the opportunity to observe lettuce, potatoes, peas, garlic, and radishes grow during the school year, thus providing them with various plant parts that people depend on to eat. Teachers without access to a school garden could have students start some of these plants as seeds in their classrooms under a grow light to observe the life cycle. Plants like lettuce, beans, and radishes work especially well as classroom plants (Piotrowski et al. 2007). Discussing simple recipes that students could use with their parents for the preparation of the food plant that they have grown in the classroom is an opportunity to help them think about how to use plants in a less-processed diet.

After completing this mini-unit and following up with hands-on experiences observing a plant grow through its life cycle, students are on their way to having the foundational knowledge needed to meet the performance expectations cited in the *NGSS* in which they must "construct an argument" connecting a "macroscopic" structure of a plant to its function (i.e., roots, stems, leaves, flowers, fruits, and seeds) (NGSS Lead States 2013, p. 38).

Finally, the students in this lesson not only learned about plant parts but were involved in using informational texts for an authentic purpose: gathering science information to compare it with their observations. This authentic use of informational texts in a science context can be leveraged to review text features, reading for information strategies, reading comprehension, and communication of information to address English Language Arts *Common Core* Standards. We found that when students are motivated to read for information related to a recent concrete science experience, they are engaged in the work and eager to learn more. The science and English language arts learning is more robust when integrated together in a relevant context for students. Stalk it up to the integration! ■

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Resources

Gibbons, G. 2007. *The vegetables we eat*. New York: Holiday House.
Waldron, M. 2014. *Flowers*. Chicago, IL: Heinemann Library.
Waldron, M. 2014. *Leaves*. Chicago, IL: Heinemann Library.

Connecting to the *Next Generation Science Standards* (NGSS Lead States 2013):

4-LS1-1: From Molecules to Organisms: Structures and Processes

www.nextgenscience.org/4ls1-molecules-organisms-structures-processes

The chart below makes one set of connections between the instruction outlined in this article and the *NGSS*. Other valid connections are likely; however, space restrictions prevent us from listing all possibilities. The materials, lessons, and activities outlined in the article are just one step toward reaching the performance expectations listed below.

Performance Expectation	**Connections to Classroom Activity** *Students:*
4-LS1-1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.	• are introduced to the development of these concepts, providing background for further development of structure and function.
Science and Engineering Practice	
Engaging in Argument From Evidence	• observe food plants and use details of the food plant to support their prediction of which part they believe it is.
Disciplinary Core Idea	
LS1A: Structure and Function • Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.	• compare and contrast plants with edible plant structures to determine which structures are edible by humans. • read informational texts and participate in class discussions in which the function of each of the main structures of plants associated with how it helps the overall plant to grow, survive, and reproduce.
Crosscutting Concept	
Systems and System Models A system can be described in terms of its components and their interactions.	• recognize that a plant is its own system with many having a root, stem, leaf, flower, and fruit because each part performs a different function for the plant.

Waldron, M. 2014. *Roots*. Chicago, IL: Heinemann Library.

Waldron, M. 2014. *Seeds and fruits*. Chicago, IL: Heinemann Library.

Waldron, M. 2014. *Stems and trunks*. Chicago, IL: Heinemann Library.

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Gibbons, P. 2014. *Scaffolding language, scaffolding learning: Teaching English language learners in the mainstream classroom* (2nd ed.). Portsmouth, NH: Heinemann.

Jones, J., and S. Leahy. 2006. Developing strategic readers *Science and Children* 44 (3): 30–34.

NGSS Lead States. 2013. *Next Generation Science Standards: For states, by states*. Washington, DC: National Academies Press. *www.nextgenscience.org/next-generation-science-standards*.

National Governors Association Center for Best Practices and Council of Chief State School Officers (NGAC and CCSSO). 2010. *Common Core State Standards for English language arts and literacy in history/social studies, science, and technical subjects*. Washington, DC: NGAC and CCSSO.

Piotrowski, J., T. Mildenstein, K. Dungan, and C. Brewer. 2007. The radish party. *Science and Children* 45 (2): 41–45.

Sorel, K. 2003. Rock solid. *Science and Children* 40 (5): 24–29.

NSTA Connection

Download the reading prompt sheet and explore data recording sheet at *www.nsta.org/SC1607*.