Appalachian STATE UNIVERSITY
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Capturing Insects And Student Interest: First Graders Learn About Unusual Plants In Their Area In This Multimodal Investigation Of Carnivorous Plants

By: Leslie Bradbury, **Rachel Wilson**, Nancy Pepper, and Mitzi Ledford

Abstract

Most plants are able to obtain all of the nutrients that they need from air, water, and soil; however, this is not true of carnivorous plants. Because they tend to live in boggy soils where there are small amounts of nitrogen, carnivorous plants have developed specialized structures that enable them to lure and capture insects and sometimes other small animals (ICPS 2015). Because Venus flytraps, pitcher plants, and sundews are all native to our state and use different structures to capture their prey, we chose those as our focus (see Internet Resources). Studying the natural world can be fascinating for young learners and can provide an opportunity for teachers to incorporate multiple tools for science communication. In this article, we describe an integrated, multimodal unit around the theme of carnivorous plants (CPs) for two first-grade classrooms. For our unit, we focused on plants with three different structures and trapping mechanisms (see Table 1, p. 45). The distinctive structures visible on the plants provided an opportunity to help students understand the link between the structure of a particular plant part and its function in survival, while also providing students the opportunity to engage in the science practices of Analyzing and Interpreting Data, and Obtaining, Evaluating, and Communicating Information (NGSS Lead States 2013).

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CAPTURING INSECTS AND STUDENT INTEREST

FIRST GRADERS LEARN ABOUT UNUSUAL PLANTS IN THEIR AREA IN THIS MULTIMODAL INVESTIGATION OF CARNIVOROUS PLANTS.

By Leslie Bradbury, Rachel Wilson, Nancy Pepper, and Mitzi Ledford

Most plants are able to obtain all of the nutrients that they need from air, water, and soil; however, this is not true of carnivorous plants. Because they tend to live in boggy soils where there are small amounts of nitrogen, carnivorous plants have developed specialized structures that enable them to lure and capture insects and sometimes other small animals (ICPS 2015). Because Venus flytraps, pitcher plants, and sundews are all native to our state and use different structures to capture their prey, we chose those as our focus (see Internet Resources). Studying the natural world can be fascinating for young learners and can provide an opportunity for teachers to incorporate multiple tools for science communication. In this article, we describe an integrated, multimodal unit around the theme of carnivorous plants (CPs) for two first-grade classrooms.

For our unit, we focused on plants with three different structures and trapping mechanisms (see Table 1, p. 45). The distinctive structures visible on the plants provided an opportunity to help students understand the link between the structure of a particular plant part and its function in survival, while also providing students the opportunity to engage in the science practices of Analyzing and Interpreting Data, and Obtaining, Evaluating, and Communicating Information (NGSS Lead States 2013).

Investigating Carnivorous Plant Specimens

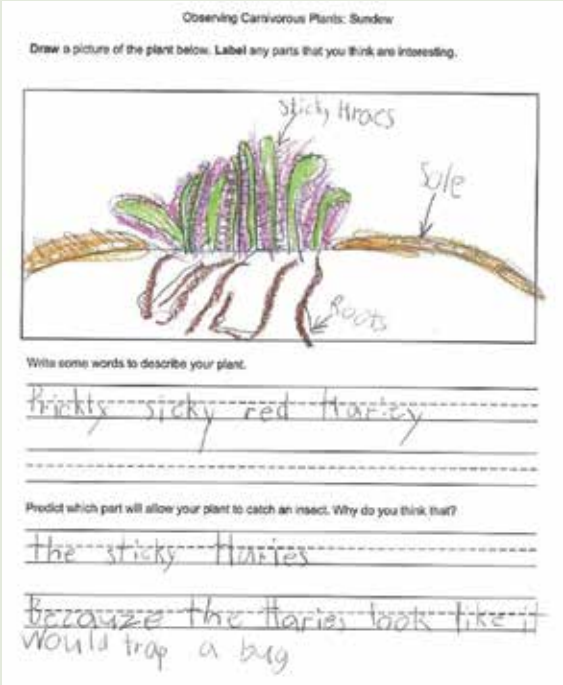
On the first day of the unit, we introduced carnivorous plants by asking students in each class if they thought there were plants that could eat animals. Several students were familiar with Venus flytraps and agreed that there are plants that could engage in this strange behavior. Other students did not believe that there are any plants that could eat animals. We shared with students that there are several kinds of plants that are carnivorous and that many of them live in our state. The first graders were excited to learn that we had brought CPs for them to investigate.

PHOTOS COURTESY OF THE AUTHORS

A student views an informative board on a tablet.

FIGURE 1.

Student data collection sample.



Before our observations of the CPs began, we had a whole-class review of the characteristics of scientific drawings. We reminded students that they should draw only what they saw and not add features such as smiley faces that were not present on the plants. We prompted students to use color to add accuracy and detail to their drawings. While students observed their plants, we asked them to complete a data collection sheet for each species where they drew the plant and labeled any parts that they thought were interesting. We reminded students that they should use their eyes and the hand lenses to carefully observe each specimen; however, students should not touch the plants with their hands or their pencils to ensure that the plants are not injured during the investigation. They also wrote descriptive words and predicted which structures on the plant would allow it to catch an insect (see Figure 1). Observing actual plants and focusing on their structures piqued students' curiosity and made them enthusiastic to learn more.

Students observe a Venus flytrap.

Participating in Integrated Centers

On the second and third days of our unit, we integrated science content with established literacy centers and added a web-based center to the normal activities. Students spent about 20 minutes at each center and rotated through three centers on Day 2 and completed the remaining centers on Day 3, followed by a review of what they had learned over the course of three days.

In one center, students were introduced to a text about CPs that was above their current reading level. The book *Hungry Plants* (Batten 2000) contains short chapters about each of the focus plants, as well as an introductory chapter about CPs and why they have their unique adaptations. In this center, the classroom teacher read preselected passages from the book, stopping frequently to ask comprehension questions about the science content and to relate the information found in the reading back to the observations that students had made previously. In the classrooms where we were working, there was a teacher and a teacher assistant. The regular classroom teacher led this center, and each group rotated to her during the course of regular rotations. The text of the book is written in an engaging style and contains accurate science information focused specifically on how the three types of CPs attract insects and use particular structures to capture them. For example, in the description of the Venus flytraps, the book states, "When two trigger hairs are touched or when one trigger hair is touched twice, the leaf trap suddenly snaps shut" (Batten 2000, p. 14). Through this teacher-led reading, students were introduced to key structures and vocabulary such as *trigger hairs* and were able to build on their previous experience with the Venus flytrap to remember that they had seen those trigger hairs on their plants.

In the second center, we asked students to compare a sample of regular garden soil and a sample of the soil used for CPs. Because the unit on CPs immediately followed the first-grade unit on soil, the second center enabled students to connect their current investigation of CPs with their previous experience with soil. We wanted to help students understand that most CPs grow in wet areas and live in different soil than the plants grown in the school garden. The recommended growing medium for CPs is a combination of damp sand and peat moss, while our garden soil is rich in humus. *Safety note:* The soil used for growing the CPs consisted of sand and peat moss purchased from a hardware store. Students washed their hands at the completion of this center.

CAUTION

In another center, students read brief passages about each CP and answered comprehension questions about each passage. We used the book *Plants That Eat Animals* (Fowler 2001) as our source; however, we chose excerpts from the book for each plant and synthesized them on one page so that the reading was developmentally appropriate for the first graders to complete independently. At this center, students were making progress on goal CCSS. ELA-Literacy.RI.1.1 as they answered questions about key details in a text. A complete set of the excerpts and questions can be found online (see NSTA Connection).

A fourth center focused on student writing and asked students to decide which of the three plants was their favorite and explain why. In this center, we wanted students to use what they had learned through observations and from their reading to justify their choice. We hoped that students would use correct grammatical conventions such as beginning their sentence with a capital letter and ending it with a period.

In the fifth center, students used a web-based resource created to gather additional information about the three types of plants from photographs and videos. The first-grade teachers have a subscription to Discovery Education that is paid for by their school system (see Internet Resources). One of the tools on the Discovery Education website enables teachers to create web pages called boards. While this feature of the website is subscription-based, a

FIGURE 2.

Work produced by higher-level student.

FIGURE 3.

Work produced by student who struggled with writing.

similar web page for student use could be created using a free resource such as Padlet (see Internet Resources).

When designing the board for this center, we wanted to supplement the text resources from the literacy centers with other modes of communication of science information. We thought that the first graders would want to see the plants eat insects a number of times, but that we wouldn't be able to feed the plants repeatedly without harming them. Therefore, we created a CP board that featured photographs of each plant in its native habitat, photographs of the plant that were taken at close range, and a map of our state showing where the plants could be found. Finally, we added the most exciting part for the students: brief videos of the plants trapping the insects. Using the Discovery Education tool, we embedded clips of videos of each plant. The videos were edited from their original source so that each was less than one minute long (see Internet Resources for the original sources for the pitcher plant, sundew, and Venus flytrap videos).

Once students had finished all of the centers, we came together as a whole class to share what we had learned. As a large group, we discussed which features each plant had for attracting and capturing insects. During this phase of the lesson, we projected the CP board onto a screen that was visible to the whole class. The photos on the board served as a common reference point as the class identified key structures and discussed how their shape helped the plant to complete the important task of capturing prey. Students were proud of their ability to use science vocabulary such as trigger hairs and tentacles accurately.

Drawing and Writing About What We Learned

For the conclusion of our unit, we asked students to produce a detailed drawing and written paragraph that demonstrated what they had learned about one of the three CPs. For this summative assessment, we expected them to combine what they had learned through direct observation, multiple texts, photographs, and video into their final products. To support students as they engaged in a writing activity that was more complex than others that they had completed during the unit, we used strategies to scaffold their brainstorming and provided sentence stems to help them organize details (Fulwiler 2011).

By the end of the CP unit, we realized that the Venus flytrap was the favorite for most students, so we asked everyone to focus on this plant for their final product. Since

TABLE 1.

Description of Plants Used in CP Unit.

Plant Name	Plant Photo	Description of Luring and Trapping Mechanisms
Venus Flytrap		• Produce sweet nectar on inside of traps to lure insects • Captures prey using modified leaves that have developed traps • When an insect walks across the leaf and touches trigger hairs, the trap snaps shut • Plant releases digestive enzymes that break down the soft body parts of the insects it traps
Pitcher Plant		• Produce a sweet nectar in the cap that attracts insects • Captures prey using modified leaves that have developed into tubes • Inside of the trap, the leaves have a smooth surface or have downward-facing hairs making it difficult for insect to escape • Digestive enzymes at the base of the trap digest the insect
Sundew		• Shiny dewdrops on the ends of the tentacles attract insects because they think it is flower nectar • Dewdrops are actually a sticky substance that traps the insect • Tentacles wrap around the insect once it is caught • A gland at the base of the tentacle produces digestive enzymes

Information in the table was found at: *www.life.illinois.edu/plantbio/greenhouse/vt_carnivorous.htm*

we knew students would be writing about the Venus flytrap, we did our scaffolding with the sundew instead. Students provided us with detail as we completed a drawing of the sundew in front of the whole class and labeled key structures that were integral for capturing insects. We also brainstormed all of the structures and characteristics that we could remember and organized them into a piece of writing using the following question stems: *I noticed that the sundew has … and …. These characteristics help the sundew to …. I think that it is cool that the sundew….*

Once the modeling was complete, we put a blank copy of the sentence stems on the board for students to refer to as they wrote about the Venus flytrap and completed their own detailed drawings. Figure 2 includes the drawing and

PLANT PHOTOS COURTESY OF RACHEL WILSON

Venus flytrap

Pitcher plant

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

1-LS-1: From Molecules to Organisms: Structures and Processes

www.nextgenscience.org/1ls1-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:*
1-LS-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.	• understand that specific structures enable the plants to capture their prey in various ways.
Science and Engineering Practices	
Analyzing and Interpreting Data Obtaining, Evaluating, and Communicating Information	• record observations of carnivorous plants using drawings and words. • compare their predictions of what parts of the carnivorous plant would help it catch prey with accurate science information they learn through videos and text. • read grade-appropriate texts and use multiple types of media to obtain scientific information. • share new understandings about the structures of carnivorous plants that enable them to capture insects using drawing and writing.
Disciplinary Core Idea	
LS1.A: Structure and Function • All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water, and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help the offspring to survive.	• observe specimens of carnivorous plants to determine how the structures present help them trap insects to get the nutrients that they need to survive. • read texts and observe videos of carnivorous plants to determine how their structures help them capture insects.
Crosscutting Concept	
Structure and Function	• investigate how different shapes and structures on three species of carnivorous plants enable them to catch prey in different ways.

Connections to the *Common Core State Standards* (NGAC and CCSSO 2010)

CCSS.ELA-Literacy.RI.1.1 Ask and answer questions about key details in a text.

CCSS.ELA-Literacy.W.1.8 With guidance and support from adults recall information from experiences or gather information from provided sources to answer a question.

Sundew

work produced by a higher-level student, while Figure 3 shows the work of a student who struggled to complete the writing portion of the assignment. The rubric used to evaluate this work is found online (see NSTA Connection).

One valuable lesson for us teachers was the importance of including drawing in the final evaluation. When designing the unit, we wanted to give the first graders the practice of writing scientifically but with the support of another mode of communication. Like other struggling writers in both classes, the student whose work is featured in Figure 3 was able to share some of what he had learned about Venus flytraps in his drawing. By offering multiple modes for students to share their understandings, teachers can provide students with assessment experiences that reinforce their developing knowledge of science without tying it solely to their skills as readers or writers. Teachers could follow up on the activities in the unit by having students construct models of the plants using common household materials that featured their unique adaptations.

Conclusion

Due to our experiences with the students' enthusiasm for and knowledge growth in CP parts and their function for luring and capturing prey, we believe that CPs offer an exciting context for preparing students to think creatively about adaptations that help organisms survive. After completing this unit on CPs, students are on their way to having the foundational knowledge to meet the performance expectations included in the *Next Generation Science Standards* (*NGSS*) in which they must "use materials to design a solution to a human problem by mimicking how plants or animals use their external parts to help them survive, grow, and meet their needs" (NGSS Lead States 2013, p. 12). ■

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

Internet Resources

Carnivorous Plant Nursery
www.carnivorousplantnursery.com

Discovery Education
www.discoveryeducation.com

Padlet
http://padlet.com

Pitcher Plant Video
http://vimeo.com/39897167

Plant Nutrients
www.ncagr.gov/cyber/kidswrld/plant/nutrient.htm.

Sundew Video
https://commons.wikimedia.org/wiki/File:Carnivorous_Plant_Time_Lapse_%28Drosera_Capensis%29_%22eating%22_a_Fruit_Fly.ogv

Venus Fly Trap Video
https://upload.wikimedia.org/wikipedia/commons/5/57/Venus_fly_trap_capturing_prey.webm

NSTA Connection

Download a data collections sheet and rubric at *www.nsta.org/SC1603*.