# The Not-So-Aloof Luffa

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A luffa is a natural vegetable sponge. With its skin on, it resembles a cucumber or a zucchini, and it is a member of the same family. Though widely grown, luffas are rarely studied. Since we discovered luffas in North Carolina back yards several years ago, we have found this gourd to be a wonderful science teaching tool. In this article, by sharing some lessons about the luffa, we hope to diminish the aloofness currently granted this humble plant.

Many dictionaries define luffa as a dishcloth gourd; a gourd is defined as the fruit of various plants whose dried shell is used for bottles and ornaments. A gourd is also any plant that belongs to the Cucurbitaceae family. Fruits are the mature ovaries of flowering plants. Vegetables are fruits that are not sweet. Remarkably, luffas are fruits, vegetables, vegetable sponges, and gourds!

Luffas present good examples in logic (e.g., all luffas are gourds, but not all gourds are luffas; all luffas are sponges, but not all sponges are luffas). They are easy to classify; the classification system or taxonomy of the luffa plant is as follows:

Kingdom: Plantae

Phylum: Magnoliophyla
Class: Magnoliopsida
Order: Violales
Family: Cucurbitaceae
Genus: Luffa
Species: cylindrica

We have used the following activities with students in Grades 3-5 and with pre-service and in-service teachers.

## ACTIVITY 1: COMPARE THE EXTERIORS OF COMMON GOURDS

### MATERIALS

Luffas (young, fresh ones)
Other gourds such as acorn, butternut, spaghetti, and yellow squashes, and zucchini
Chart paper, blackboard, or transparencies (for observation and to make Venn diagrams)

### PROCEDURE

1. Introduce a young, freshly picked 15-23 cm (6"-9") luffa to the class as a mystery item. Allow the students (in groups or individually) to examine it.
2. Write the students' observations on the board, on chart paper, or on an overhead transparency. Have students describe the luffa's exterior, using as much detail as possible; encourage them to use four of their senses (do not encourage tasting yet). Students might describe the luffa in these terms: bumpy, sandy, pointed-bottom, has lines, brown, has a stem, is food-like, has creases, is banana-shaped, is cone-shaped, light-weight,

and has a smell.

3. Next, students can predict what this item is. Record their predictions along with their observations but distinguish between the two. Encourage students to think about whether this mystery item is living or nonliving, plant or animal, fruit or vegetable, and edible or inedible. By its shape, the students might guess that the item is a vegetable, most likely a cucumber or a zucchini.

4. Explain to students that the mystery item is a vegetable and that it is called a luffa! If students have any prior knowledge of the luffa, let them share it. Compare and contrast the luffa to the other gourds represented. Begin by giving each group of students one luffa and one other gourd to compare and contrast. Use Venn diagrams to display similarities and differences in the gourds' exteriors. Venn diagrams represent sets (drawn as circles) and the logical relationships between them. An area of overlap between two circles contains elements that are common to both sets. Focus on color, size, weight, circumference, shape, and shell characteristics (see Figure 1).

## ACTIVITY 2: COMPARE THE INTERIORS OF COMMON GOURDS

### MATERIALS

Luffas (fresh)
Dried luffas
Knife (for teacher to cut open luffas)
Chart paper
Other dried gourds

### PROCEDURE

1. Have the students predict what the interior of the luffa will look like. Will it be solid or hollow? Will it have fruit? Will it be soft or hard? Will it have seeds? If so, how many? What colors will the fruit and seeds be? Record their predictions on chart paper.

2. Pass around examples of dried luffas and cut the fresh luffa open for students to observe. Allow students to make and record their observations. Ask students to describe the luffa's interior. Have them differentiate the various parts of the luffa--its fibrous sponge and seeds.

3. Slice the other gourds in half. Compare and contrast the luffa's interior with that of the other gourd's interiors. Record the students' observations and descriptions of each gourd. Display on a chart or diagram the similarities and differences between the gourds (see Figure 2 and photo of gourd interiors).

## ACTIVITY 3: USE A CLASSIFICATION KEY TO IDENTIFY THE PREVIOUS GOURDS

### PROCEDURE

1. Using the key in Figure 3, have students identify the common gourds. Each step in the key requires students to separate the collection of six gourds into 2 groups. For example, three gourds are green (luffa, acorn, and zucchini), and three gourds are not green (spaghetti, butternut, and yellow squashes). Students should take either the green group or the not-green group of gourds and follow the key to the next step as indicated by the go-to directions on the key. The next step with the green gourds is to separate gourds with a fibrous interior from those without a fibrous interior. Next, separate the not-green gourds that are oval from those that are not oval. Students should continue through the key until each gourd is eliminated from a group, stands alone, and is thus "identified" or "keyed out." Gourds can be purchased from your local grocery store, but the teacher will need to find a local source for fresh luffas. Students can also grow their own luffas in a school garden.

2. To complete this lesson, cut each gourd in half so that students can observe the interiors as well as the exterior surfaces of each gourd. Have students carefully examine each of their six gourds. Have them look at both the exterior and interior surfaces. They should follow the directions at each step in the key until they have identified each of the six gourds by a common name.

## ACTIVITY 4: OBSERVE THE LUFFA'S LIFE CYCLE

**MATERIALS**

Luffa seeds (Order luffa seeds from garden supply companies [see Resources] or purchase them locally in stores that sell vegetable seeds. A packet of luffa seeds is also available from the World Seed online catalog for $1.39.) http://mall1.register.com/world-of-seeds/index.htm

Organic soil
Planting space
Water
Sunlight
Paper (for illustration)

**PROCEDURE**

This lesson is best done in the fall. One class can plant luffa seeds in the spring, providing the next year's class with ripe luffas to harvest in the fall. This process can continue year after year with luffa study in the fall and planting in the spring because the luffa is an annual (grown each year from seeds) plant. The following list gives some facts about the life cycle of luffas as well as how they are planted, grown, and harvested:

* Plant seeds in good, organic soil in a hotbed or outdoors in March or April after the chance of frost is past. Luffas prefer sunlight and a hot climate.
* Vines are drought tolerant, but when they are watered plentifully they may grow up to 15cm (6") a day.
* Flower buds form when vine is approximately 10.2 cm (4") tall.
* Many gourds grow on a single vine and can weigh as much as 5 lbs.
* Provide a trellis so fruits are kept off the ground.
* Fruits grow to over 0.61 m (2') long.
* If left on the vine, the skin will dry up and discolor the sponge fibers.

Using this information, students can create a "luffa life cycle" illustration. Encourage them to be creative and thorough in their representations.

**ADDITIONAL PLANT FACTS**

* Striped cucumber beetles eat luffa seeds.
* Young leaves can be eaten at any time.
* Young fruit can be eaten until it gets as large as cucumbers. Like zucchini and summer squash, luffas taste better when they are young and tender.
* Gourds are not frost tolerant.
* Bumblebees pollinate luffas.
* The most serious pest is the leaf-footed plant bug (it eats the fruit, resulting in deformed areas on the sponge).

**ACTIVITY 5: ABSORPTION AND SPONGES**

Often when it is time to do projects for the science fair, students must come up with their own experiments. This activity helps introduce students to the methodology required for science fair projects. Teachers and students can think about how to conduct an experiment on sponge absorption. For example, students may decide to measure how quickly the three different types of sponges can absorb 10 ml of water. One-inch cubes of each sponge type can be cut from larger sponges. Use graduated cylinders to measure water. The water can be poured into three identical shallow bowls, and students can measure time (watch with a second hand works fine) required to absorb water from each bowl. As students conduct these activities, they will develop a deeper understanding of the scientific process. For example, students may decide that it is difficult to tell when all the water has been absorbed, and so they may add three drops of red food coloring to each water sample. If the sponge cubes do not absorb 10 ml of water, the students may decide to try the same experiment with 5-ml

samples of water.

Students may decide to leave the sponge cubes in each bowl of water for 2 minutes but to weigh the sponges before beginning the experiment and immediately after the 2-minute absorption time and then calculate the weight of water absorbed by each sponge type in a 2-minute time period. Some students may wring water absorbed from sponges and then measure the volume of water absorbed and the volume of water wrung out. The idea is for the students to think about the process and conduct experiments to determine the relationship between sponge type and absorption.

Absorption: Vegetable luffa sponge vs. animal sponge vs. synthetic sponge

Hypothesis: Because it is more fibrous, the luffa sponge will absorb more water than either the animal sponge or the synthetic sponge.

**MATERIALS**

Luffa and animal sponges
Synthetic sponges
Water
Containers
Measuring devices (decide on method of absorption measurement.)

**PROCEDURE**

1. Measure exact amounts of water into three containers and allow sponges (of proportionate size, weight, and surface area) to absorb water for exactly the same amount of time. Record all observations and measurements.
2. Record all results. Compare actual findings with original hypothesis.

**EXTENSIONS**

Encourage students to think about how the interior of the luffa sponge can be used. Some students may have seen luffas before; their parents or grandparents may have used luffas as washcloths or dishcloths. Luffas are sold in department stores, discount stores, and in stores that sell upscale bath and beauty products.

Share background information on the luffa, using the facts presented in this article and any research articles that students may find (see sidebar). We share products we have found where luffas are used as soaps, body sponges, and back scrubbers. As a further extension, students can invent their own luffa products and illustrate advertisements for their inventions.

**CROSS-CURRICULUM EXTENSIONS**

* Compare and contrast marine sponges, luffa sponges, and various synthetic sponges with respect to use, cost, and durability. (Science and Social Studies)
* Use marine sponges, luffa sponges, and synthetic sponges in a variety of art activities, and compare the artistic effects and results of each sponge. (Art)
* Prepare and eat edible gourds, including luffas. (Home Economics)

See Figure 4 for other ideas on integrating luffa study across the curriculum.

**INTERNET RESOURCES**

Many Web sites include information on the luffa gourd. A useful Web site is located at http://hammock.ifas.ufl.edu/txt/fairs/12467.

ADDED MATERIAL

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Figure 3. Gourd key.

| | | | |
|---|---|---|---|
| 1 | A | Green | go to 2 |
| | B | Not green | go to 4 |
| 2 | A | Fibrous interior | luffa |
| | B | Not fibrous interior | go to 3 |
| 3 | A | Tan seeds | acorn squash |
| | B | Not tan seeds | zucchini |
| 4 | A | Oval | spaghetti squash |
| | B | Not oval | go to 5 |

Examples of gourd interiors.
Top, bottom: Third grade students using their senses to make observations about the interior (sponge) of the luffa.
Figure 1. Gourd exteriors.
Figure 2. Gourd interiors.
Top left: Luffa and vine flower.
Right: Mature luffa (fruit) just before it ripens.
Bottom: Harvested luffas ... skinned, washed, and hung to dry.
Figure 4. Examples of cross-curriculum extensions.

**INTERESTING LUFFA FACTS**

* In the late 1500s, a tribe in Northeastern America used luffas. The females in this tribe were remarkably beautiful, and this beauty was attributed to their use of luffas while bathing. (Social Studies)

* In the 1893 Vaughan's Seed Store Catalog, a Japanese man was pictured using the luffa gourd as a washcloth. (Social Studies)

* Luffas are heavy seed producers; they bear as many as 850 seeds in a single fruit. (Math)

* Inside the luffa is a mass of spongy tissue which, when processed, makes excellent pot holders, door mats, table mats, towels, sponges, bathroom rugs, gloves, sandals, sun helmets, and pillow and mattress stuffing. One North Carolinian resident remembers watching his grandmother wash dishes with luffas; now, as an adult, he grows luffas. Other names for luffas are towel gourds, dishcloth gourds, and vegetable sponges. (Social Studies and Health)

* During World War II, the U.S. Navy used luffas as filters in steam engines. The Army used luffas to wipe jeep windshields. (Social Studies)

* Luffas have been used medicinally in many parts of the world to treat intestinal worms, hemorrhaging, hernia, scarlet fever, smallpox, toothaches, and parasitic infections. (Health)

* The Japanese slice the young fruits and dry them in the sun, as they would apples. Malays relish the young leaves, whereas the Vietnamese eat the male flowers and flower buds. (Social Studies)

For more interesting facts about the luffa, contact the American Gourd Society at P.O. Box 274, Mt. Gilead, OH 43338, (419) 946-3302, or read their publication called The Gourd.

**LUFFA SPONGE, GOURD, AND SEED SOURCES**

Oral Leddon & Sons
P.O. Box 7
Sewell, NJ 08080
Peace Seeds
2385 S. E. Thompson St.

Corvallis, OR 97333
The Banana Tree
715 Northampton St.
Easton, PA 18042
Hollar Seeds
P. O. Box 106
Rocky Ford, CO 81067
W. Atlee Burpee Co.
300 Park Ave.
Warminster, PA 18974
J. L. Hudson, Seedsman
P. O. Box 1058
Redwood City, CA 94064
Richters
Goodwood, Ontario
Canada LOC 1AO
Thompson & Morgan
P.O. Box 1308
Jackson, NJ 08527

**RESOURCES**

Bailey, L. H. 1923. Manual of gardening. New York: Macmillan.

Holdsclaw, T. 1993. "Ten years of growing years." The Gourd 23(2): 12-13.

"Luffa legend." Spring 1994. The Gourd: 14-21.

Organic Gardening Magazine Staff. 1978. "Luffa." Encyclopedia of organic gardening. Emmaus, Pa.: Rodale Press.