

Focus/Overview

This lesson focuses on a simple experiment that examines the protective properties of summer squash skin. In this experiment, the teacher will prepare summer squash (zucchini) purchased at a local store by poking holes with a fork in half of the specimens. Students will examine the squash after two weeks of being kept at room temperature and compare the punctured zucchini with fresh zucchini.

Learning Objectives

The learner will ...

- In a complete sentence, accurately state how holes in the skin of the zucchini squash examined during the Explore activity affect the fruit. (LO#1)
- In a complete sentence, accurately state the role of the zucchini skin in protecting the seeds of the zucchini fruit. (LO#2)

Grade Level

4th grade

Duration

One 40-to-50-minute class

Subject Area

Science

Setting

Classroom

Vocabulary

Summer squash, winter squash

Next Generation Science Standards (2013)

4-LS1-1

Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

Louisiana Student Standards for Science (2017)

4-LS1-1

Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

Advance Preparation

1. Zucchini preparation

Two weeks before lesson:

- Purchase zucchini squash (two squash per group of four students).
- Squash should be approximately the same size (length, diameter) but no more than 6 inches long. All zucchini should have intact skin (no holes of any kind or blemishes).
- Wash and pat dry the squash, being careful not to pierce the skin. Place two zucchini in a shallow rectangular container (inexpensive containers can be purchased at Dollar Tree or similar stores).
- Take one zucchini and poke holes with a fork along the upper surface of the zucchini (zucchini B, at right). Leave the other one as is (zucchini A, at right). Loosely cover the containers (lids are fine, as is plastic wrap). Place the containers in a place where they will be undisturbed for about a week.
- Optional: Take pictures of the following process so you can create a visual presentation using Power Point, Google Slides or other similar programs to share with students.

A day or two before lesson:

- Purchase zucchini squash (one squash per group of four students).
 - Squash should be approximately the same size (length, diameter) but no more than 6 inches long. All zucchini should have intact skin (no holes of any kind or cuts).
2. Label a sheet of typing paper cut to fit containers for each group of students so that each squash is identified: Squash A, Squash B. See image at right.



- Preview the time lapse video of a zucchini squash rotting (link below). You will only show the video from the beginning through 1:54 (after this mark, the video runs in reverse and can be confusing to students). There is music that accompanies this video – you can mute the sound as it is not necessary.

Temponaut Timelapse (May 14, 2017). Zucchini Time Lapse (video):

<https://www.youtube.com/watch?v=3EKVvY3u8ww>

Blackline Masters

- Observing Zucchini
- Check for Understanding (and Key)

Background Information

The subject of this lesson is zucchini, which is one type of **summer squash**, which are also known as Cucurbita pepo (L.). The other commonly recognized types of summer squash are: straightneck, crookneck, and scalloped. Summer squash fruits come in an array of colors and can be solid colors or speckled. These tasty fruits, which humans have been eating for 8,000 to 10,000 years, descended from wild squash that can be traced back to Central America. Squash plants have both male and female flowers on the same plant (monoecious), with female flowers forming fruits. Pollinators, such as bees, are required to transfer pollen from the separate flowers for adequate fruit set and growth. Even the flowers of these fruits, both male and female, are delicious.



Summer squash are more delicate than winter squash as they are harvested while immature, have a soft skin, and are highly perishable. They are harvested only a few days (three to six days) after flower/bloom and cannot be kept very long after they are picked from the plant. Summer squash can be eaten raw with your favorite dip or salad, or they can be seasoned and cooked. They are low in calories and are a good source of fiber, vitamin C, and vitamin B6. These plants are in the same plant family as melons, watermelons, and cucumbers and are actually botanically fruits (not vegetables)!

The outer protective layer of a vegetable or fruit is called the **skin, peel, or rind**. This layer is the first line of defense for protecting the inner part of the vegetable, especially its precious seeds, from the environment. For some squash, the skin/rind is tough and thick (like pumpkins and acorn squash), and so they last a relatively long time in storage. These are called **winter squash**, and they typically are harvested when the fruit is mature (often two months after pollination and fruit set). Also, the rind is hard, and the fruit resists denting by thumbnail pressure. Winter squash (Hubbards, butternut, acorn) can be stored for many months if they are properly cured and stored. In the U.S., pumpkins are essentially a winter squash with a bright orange, hard rind that stores well. In contrast, for **summer squash**, the skin is tender, especially when the vegetable or fruit is young as it is commonly found in grocery stores. The skin is very soft and can easily be damaged by rough handling after harvest and at home and cut with a thumbnail. So, the names summer and winter squash relate to different species and types of cucurbit plants that are harvested at different points and can be stored for different lengths of time.

Zucchini



Yellow Squash (Straightneck)



Yellow Squash (Crookneck)



Patty Pan Squash



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References

Green Mountain Farm-to-School. (no date). Summer squash. Available at:

http://www.vermontharvestofthefarmtotheschool.org/uploads/2/8/9/6/28966099/squash_educator_2015.pdf.

Louisiana Commercial Vegetable Recommendations. Available at:

<https://www.lsuagcenter.com/NR/rdonlyres/1A445217-3622-4161-ACF9-C0F28FC6E753/59038/pub2433commvegetableBWLOWRES.pdf> (pages 55-57).

Materials List

Engage

- Examples of zucchini, yellow/crookneck, patty pan (scallop) summer squash (one each). Note all summer squash are warm-season vegetables. The activity can be done with the first two if patty pan squash cannot be found in a store.

Explore

- Three zucchini squash for each group of four students (see detailed preparation No. 1 and No. 2 above).
- One container large enough to hold the zucchini.

Extend

- Projector for videos.

Procedure

Engage

1. **Let's see how many of you know these fruits.**
 - Hold up a zucchini squash. **What is this one called?** (*Zucchini*)
 - Hold up a yellow squash. **What about this one?** (*Yellow squash or crookneck/straightneck squash*)
 - Hold up a patty pan squash. **How about this one?** (*Patty pan squash, also known as white squash or scallop squash*)
 - Hold up a winter squash (*Butternut, acorn*). **Do you know the name of this one?**
2. **I am going to pass these different types of squash around. As you observe each squash, think about what characteristics they have in common.** Give the students about three to four minutes to examine at least two of the three types of summer squash.
 - **What are some things that the squash you saw had in common?** (*There will be any number of answers to this question. The one we would like the students to observe is that the skins of these summer squash are very tender/soft and can easily be dented by our fingernails.*)
 - **Yes. These squash all have very soft skins. This characteristic, their soft skin, is what we will be investigating today.**

Explore

1. Have students sit in groups of four. Ask students to have a pencil available to write their answers. Hand out a copy of **Blackline Master 1** to each student.
2. **Students, today we will make observations on an investigation that I started for us two weeks ago. I need a group member from each group to come to our materials area and take a container with three zucchini squash in it. Please carry it carefully back to your group. Please don't touch the zucchini squash until we are all ready to begin.**
3. Have students work through the directions on Blackline Master 1. Circulate and assist as needed.

Explain

1. Discuss the worksheet with the students.
 - **How did the fresh zucchini look?** [*green*] **How did the two-week-old zucchini look?** [*green, maybe a bit wrinkled*] **What difference did you detect between these two just based on looks?** [*not much difference just based on looks*]

- **How did the fresh zucchini feel when you gently squeezed it?** [*firm*] **How did the two-week-old zucchini feel?** [*softer, squishier*] **What difference did you detect between the two just based on feel?** [*the two-week old zucchini was much softer than the fresh zucchini*]
- **What difference did the holes in the two-week-old zucchini make?** [*It was much squishier than the other two. It was also more wrinkled.*] **Why is this a big deal?** [*It's a big deal because holes in the skin allow the zucchini to become squishier faster. These holes allow water to evaporate from the fruit, which makes it squishy. The holes also allow mold to grow inside the zucchini fruit.*] **Based on your observations, what is the role of the skin on a zucchini fruit?** [*The skin protects the zucchini fruit and keeps it fresher longer. It protects the seeds inside the fruit.*]
- **Raise your hands if you can remember back to the start of the lesson when I passed out two/three kinds of summer squash?** [*Students will raise hands.*] **Besides typically growing in the summer/warm season, what did all those have in common?** [*They had soft tender/skins.*] **How long do summer squash last once you have picked them off the plant?** [*Up to five days.*] **Why is it important to pick and eat summer squash soon after they are picked off the plant?** [*That is when they are freshest to eat, and quality decreases if not stored properly.*]
- **If you were in a grocery store and had to pick out a fresh zucchini, what would you rely on most? Looks or feel?** [*Mostly on feel.*] **Why?** [*A firm summer squash is freshest. I would also be inspecting the fruit because I don't want many blemishes on the skin.*]

Extend

1. This time-lapse video shows what happens when a partially cut-up zucchini is left to decompose. Encourage students to make careful observations about this video. *NOTE: Only play the video between the start and marker 1:54. The remainder of the video is in reverse, which may confuse students.*
[Temponaut Timelapse](https://www.youtube.com/watch?v=3EKVvY3u8ww) (May 14, 2017). Zucchini Time Lapse (video).
<https://www.youtube.com/watch?v=3EKVvY3u8ww>
 The connection to this lesson is that instead of fork prong holes, the zucchini has actually been cut. Questions you might ask about this video:
 - **Instead of using a fork to cut the skin of the zucchini, what did they do?** [*They used a knife and made slices.*]
 - **Where does the zucchini begin to shrivel first?** [*The zucchini begins to shrivel first near the cut parts.*]
 - **What is happening to the largest piece of zucchini?** [*The largest piece of zucchini doesn't change much at the start ... except by where it was cut. That is where it shrivels most.*]
 - **What pieces start to mold first?** [*The smaller cut pieces.*]
 - **Who can remember the job of the skin of the zucchini?** [*To protect the seeds inside the fruit.*]
 - **Who can remember how summer squash gets its name?** [*These types of squash are immature fruit and need to be eaten quickly once they are harvested from the plant because they do not stay fresh long.*]
2. Your students will find it interesting to see how zucchini grows on the plant. These two YouTube videos are very short.
 - How to Harvest Zucchini: <https://www.youtube.com/watch?v=ux01pZb1-Ws>
 - Harvesting Zucchini: <https://www.youtube.com/watch?v=116OfopJHvY>

Evaluate

1. A short evaluation (**Blackline Master 2**) is provided.

Resources

Oklahoma Ag in the Classroom. (no date) Pumpkins, squash and other cucurbits - Oklahoma Ag in the Classroom. Available at <https://www.agclassroom.org/ok/lessons/lessons/cucurbits.pdf>.

A selection of lesson ideas (English-language arts, math, social studies, science, visual arts) and information on cucurbits.

USDA Healthy Meals Resource System. (no date). Summer squash and zucchini. Available at <https://healthymeals.fns.usda.gov/summer-squash-and-zucchini>.

A selection of fact sheets, recipes and information on growing summer squash.

USDA SNAP-Ed Connection. (24 August 2018). Seasonal produce guide – What’s in season: Summer squash. Available at <https://snaped.fns.usda.gov/seasonal-produce-guide/summer-squash>.

A selection of fact sheets, recipes and lessons on growing summer squash.

Recommended Children’s Books

Miller, P. Z. (2013). *Sophie’s squash*. New York, NY: Random House Children’s Books.

A children’s book about a young girl who selects a squash on a visit to a farmer’s market. She carries it everywhere she goes, and eventually learns what happens to squash over time. Winner of an Ezra Jack Keats New Writer Honor and a Charlotte Zolotow Honor. Lexile: AD55L. Age 3-7 years. ISBN-13: 9780307978967.

Scale, Gayla. (2002). *The Little Squash Seed*. Overmountain Press.

This rhyming story tells the story of a squash from seed to edible vegetable. Age 2 and up ISBN-13: 978-1570722387.

OBSERVATION SHEET: Holey Zucchini!

Fresh Zucchini

In this box, use your pencil to draw a picture of your **FRESH ZUCCHINI**:



Describe how the fresh zucchini looks:

Give the fresh zucchini a gentle squeeze. Describe how the fresh zucchini feels:

OLD ZUCCHINI WITH HOLES IN IT

In this box, draw with a pencil a picture of your **HOLEY ZUCCHINI**:



Describe how the holey zucchini looks:

Give the holey zucchini a gentle squeeze. Describe how the holey zucchini feels:

What do you think the holes in the skin of the zucchini do to the zucchini?

What is the job of the zucchini skin?

If you were in a grocery store and wanted to choose the freshest zucchini, what would you look for or do? _____



Check for Understanding: Holey Zucchini

Write the letter of the correct answer on the line in front of the question.

- _____ 1. The zucchini squash that is just picked from the plant looks _____. (LO#1)
 A. smooth and has no cuts or dents in its skin.
 B. wrinkled with lots of cuts and dents in its skin.
 C. no different from the zucchini with holes in its skin.
- _____ 2. Fresh zucchini feels _____. (LO#1)
 A. firm when I gently squeeze it.
 B. squishy when I gently squeeze it.
- _____ 3. The skin of the zucchini _____. (LO#1)
 A. is not easy to dent with my fingernail.
 B. is easy to dent with my fingernail.
- _____ 4. The job of the zucchini skin is to _____. (LO#2)
 A. look pretty so we will want to eat it.
 B. keep birds away.
 C. help protect the zucchini seeds inside.

-----cut here-----

Check for Understanding: Holey Zucchini

Write the letter of the correct answer on the line in front of the question.

- _____ 1. The zucchini squash that is just picked from the plant looks _____. (LO#1)
 A. smooth and has no cuts or dents in its skin.
 B. wrinkled with lots of cuts and dents in its skin.
 C. no different from the zucchini with holes in its skin.
- _____ 2. Fresh zucchini feels _____. (LO#1)
 A. firm when I gently squeeze it.
 B. squishy when I gently squeeze it.
- _____ 3. The skin of the zucchini _____. (LO#1)
 A. is not easy to dent with my fingernail.
 B. is easy to dent with my fingernail.
- _____ 4. The job of the zucchini skin is to _____. (LO#2)
 A. look pretty so we will want to eat it.
 B. keep birds away.
 C. help protect the zucchini seeds inside.

Check for Understanding: Holey Zucchini

Write the letter of the correct answer on the line in front of the question.

- A 1. The zucchini squash that is just picked from the plant looks _____. (LO#1)
A. smooth and has no cuts or dents in its skin. **CORRECT**
B. wrinkled with lots of cuts and dents in its skin.
C. no different from the zucchini with holes in its skin.
- A 2. Fresh zucchini feels _____. (LO#1)
A. firm when I gently squeeze it. **CORRECT**
B. squishy when I gently squeeze it.
- B 3. The skin of the zucchini _____. (LO#1)
A. is not easy to dent with my fingernail.
B. is easy to dent with my fingernail. **CORRECT**
- C 4. The job of the zucchini skin is to _____. (LO#2)
A. look pretty so we will want to eat it.
B. keep birds away.
C. help protect the zucchini seeds inside. **CORRECT**



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