Lesson 3. How Hairy is a Population of Radish Plants?

Plan Lesson 3

In Lesson 2, students observed a trait and its variants in a radish and a snail population. Today, the class takes a close look at another radish trait called "hairiness." It may well be a surprise for students to find that tiny hairs may appear on both the leaves and stems of radishes, and on other plants too!

It's one thing to describe the hairiness of an **individual** radish plant. Today, students describe how many variants of hairiness there are across a **population** of radishes. Students make a graph to describe hairiness trait variants in a population of lab-grown radish plants. Students learn that any trait variant can be measured and graphed.

First, students examine live plants to see if they can detect any hairs. Next, they consider whether every plant in a population of radishes will have the same number of hairs. To test their prediction, they count hairs in a set of photographs of leaves of 49 individual radish plants. These data, written on individual sticky notes – each representing one plant – are compiled on a graph. Based on evidence from their own data, they respond to the question:

How hairy is a population of radish plants?

By the end of this lesson, students will have been (re)introduced to the concepts of population and trait variants. They will also begin to think about how having certain trait variants might affect individuals.

Learning Targets in this Lesson
- Trait variants such as number of hairs can be measured and graphed.
- A graph can show how trait variants are distributed in a population.

Sequence of Experiences		
1. Introduction	All Class	5 Minutes
2. Collect and Record Data from Plants	Small groups	20 Minutes
3. Make Meaning of Class Data	Discussion	15 Minutes

| 4. Wrap Up | All class | 5 Minutes |

Materials

<u>For each student</u>
Notebook page 8
2 radish photos from the class set **(There are 49 photos in the set, so this number is intended for a ~25-student class. If you have a smaller class, distribute the photos as evenly as possible; some or all students may get more than 2)**.
2 "sticky" notes to record the number of hairs observed on each radish plant photo **(see above note – 1 sticky note per radish photo)**.

<u>For each small group of 3-4 students</u>
A selection of live plant material selected because the leaves and stems are "hairy" (see example below). Preference is for radish plants that have been grown 2-4 weeks prior to the start of the unit.

Optional: hand lenses for looking for hairs.

<u>For the class</u>
A graph template (see preparation)
Slide deck for this lesson

Preparation
- Collect the "hairy" plant material (leaves, small plants). This is preferably a pot of radish plants the class has grown or radishes from the store with leaves attached. Other plants that have hairs include sage, mint, or tomatoes.
- Divide the class set of radish leaf photos to ensure that each student has at least 2 photographs and 2 sticky notes.
- Prepare a graph across three pieces of chart paper, **so you can display the graph and refer to it later in the unit**. Three pieces will be needed to accommodate the full x-axis:
    - Write the title on the graph: How "hairy" are radish plant leaves?
    - Write "Number of Hairs" on the x-axis and "Number of Plants" on the y-axis.
    - Label the x-axis with 1, 2, 3, 4 . . . through 24.
    - Leave space for students to add their stickies (rough sample illustrated below).
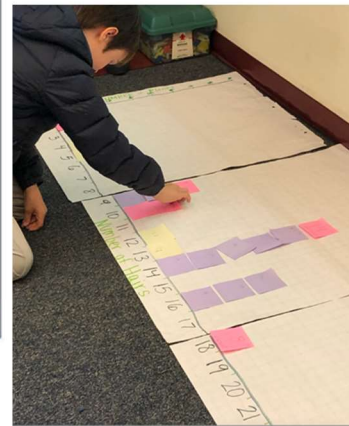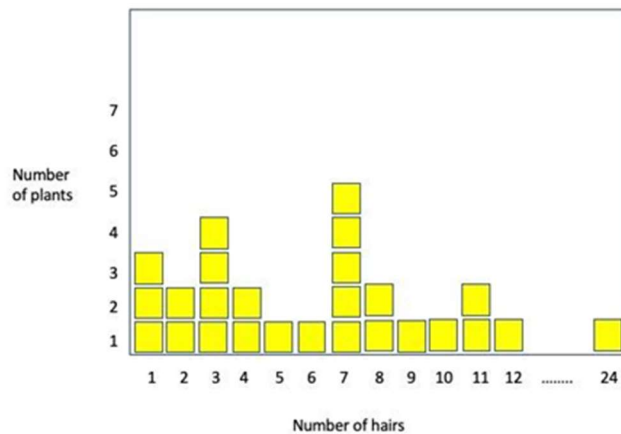
The Lesson

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1. Introduction   All class   5 minutes
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Gather the class in a discussion circle. Ask:

> *Can you think of any living things that have hairs?*

(Dogs, cats, people) The group may not mention plants!

> *Do you think that plants have hairs?*

Wait for a couple of student responses, then explain that today they are going to observe some live plant material to see what a plant hair looks like. Then they'll be introduced to a scientist who became interested in the "hairiness" trait and will use photographs of her plants to figure out if individual radish plants in her population all have the same number of hairs.

Remind students that in Lesson 2 they saw that all seedlings had rootlets, but they were not all the same length. Today the class will look at another plant trait that scientists call "hairiness."

> *Do you think that leaves from individual radish plants will have the same or different numbers of hairs? Why?*

Ask students to move to their small group locations.

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2. Collect and Record Data from Plants   👥 Small groups   🕐 20 minutes
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Students see if they can find hairs on some samples of plants (5 minutes)
Distribute plant material and hand lenses (if you have them) to each group.
Give students 3-5 minutes to observe the leaves and stems of the plants to see if they can find any hairs. This experience will help them interpret the photographs they will use to count hairs.

It may help to shine a light on the leaf, hold the plant up to a light, or view it against a dark background.

Once you are satisfied that all have observed hairs, describe the data gathering and graphing activity.

The activity (15 min)
Set the stage:

> *A scientist named Nikola became fascinated by the "hairiness" trait in plants. She has been growing and observing radishes for a long time trying to figure out why plants are hairy.*
>
> *She took close-up photographs of the part of the leaf that connects it to the stem of 50 different plants in a radish population. The close-up pictures make it easier to see and count hairs. We are going to help her by counting the hairs on her radish plants in the pictures she has provided and show our results on a graph. Each photograph comes from a different individual plant.*

Project the pictures of a close-up, enlarged photograph of the stalk of one leaf in a radish plant. Point out that 10 hairs are visible.

Explain that each student will count the hairs on photographs from 2 plants. Students will (i) count how many hairs they observe and (ii) write each count on a separate sticky note.

Once students have collected their data, point to the graph template you have prepared. Show the class how to interpret the 2 axes and how to locate an appropriate spot for each sticky. With your guidance, have students put their stickies on the class graph. the class graph. A graph will be created where each sticky note corresponds to one plant. Stickies should be stacked along the x-axis, as shown in the above example.

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3. Make Meaning of Class Data   Discussion   15 minutes
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Gather the class for discussion.

The purpose of this discussion is to see if the class can use data displayed in the class graph as evidence to answer the investigation question. In addition, this counting and graphing activity builds on the generalization (traits vary) highlighted in Lesson 2 and gives students tools for being more specific.

Looking at the class data, remind the class of their predictions and the investigation question, and ask:

How hairy are radishes in a population of radish plants?

Listen for student responses.

Students may have learned about measures of central tendency in math class and may offer the mode as one measure. Others may mention the range.

To support the discussion further, ask

Which stack of sticky notes is the tallest?
(Students will identify the tallest stack of stickies)

What does the height of a stack tell us?
(How many plants have that number of hairs.)
Optional: Explain to students that the count that appears most often is called the "mode" by scientists. Label the mode on the graph.

What is the lowest number of hairs? The highest number?

Optional: Once students have identified these values, explain that scientists name the lowest and the highest numbers the "range." Draw a bracket underneath the stacks of stickies from lowest to highest and label it the range.

Ask:

Suppose Nikola planted seeds from these plants. What do you think a graph of the number of hairs will look like in the plants that grow up from the seeds?

Listen to student responses for ideas that they will stay more or less the same because babies in the next generation will tend to look like their parents.

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4. Wrap Up   All class   5 minutes
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Ask students what ideas and information they will "take away" from today's lesson.

Listen for these ideas. Use student language as much as possible when you write add them on the Takeaways Chart:

- Plants can have hairs!
- The number of hairs isn't always the same/can differ from one plant to another.
- We can measure little differences in the plants using graphs.

Remind the class that we can describe the "hairiness" of an individual plant by counting and we can describe the "hairiness" of a population by counting and graphing the hairs on each individual plant in the population.

Before completing the lesson, ask students to turn to page 8 in their notebooks, where they will answer a question about what they learned today.

Lesson 3: How hairy is a population of radish plants?
List one thing you learned from the graphing activity today.

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Our question for next time is:
Is this true for animals as well as for plants (radishes)?