

Do something COOL

Teacher-Led Educational Activity

HOW MANY BEANS IN A POD?

Using a random sample of edamame, students will collect, present, and interpret data to determine the number of beans a soybean pod is likely to contain.

Suggested grade level: 3–5

Time: Two class periods

Materials

- Bag or bags of raw edamame (with pods). Each pair of students will need 15 pods. (Option: Use cooked edamame, which the students can eat as a snack after they finish the activity.)
- Paper plates or napkins
- Plain paper and graph paper
- Colored markers or pencils

Vocabulary

Graph: a visual representation of a group of numbers, or values

Mathematical mean: the average of all the numbers in a group

Mode: the number that occurs with the greatest frequency in a group

Edamame: green soybeans (not mature; green in color)

Objectives

Students will be able to:

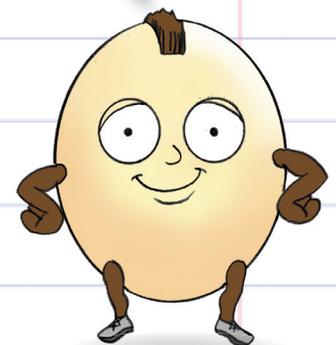
- Collect and record data.
- Organize data in categories and put data in a frequency chart.
- Calculate a mathematical mean (average).
- Display data in a graph: a line plot or histogram.
- Interpret the graph to find the mode.
- Determine whether the mean or mode is the best measure for expressing the most common number of beans in a pod.
- Based on their findings, predict the number of beans that is most likely to be found in a pod selected from another sample of edamame.

Background

What is edamame? Edamame (e-duh-MAH-may) is a type of soybean grown as a vegetable much like green peas and lima beans. Because edamame are picked while they are younger and green, they are soft and edible when cooked, not hard and dry like mature soybeans used to make both edible and non-edible products. Soybean varieties used to grow edamame differ from field soybeans. Edamame are larger, more tender, and sweeter tasting than field soybeans.

Expressing data in a graph: When students examine a sample of edamame pods (or other bean), they will observe differences in the size of the pods and the number of beans contained in a pod. They will recognize variation among individuals within the same type of soybean—"the same but different."

Count, then eat, OK?



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Background continued.

In this activity, students will make graphs to express mathematically the concept of biological variation—an essential tool for scientific inquiry. Their graphs will clearly show that the variation in their sample of edamame has a pattern: there is a range in the number of beans in a pod, the number of beans can be categorized, and one category is likely to occur most frequently. They can use this evidence to predict the most likely number of beans in pods selected from a future sample of edamame.

Mean vs. mode: A core component of this activity is measuring the central tendency, or frequency, in a set of data. Students will use both the measures of mean and mode to describe their data. Both measures are valid. But in this activity, students will discover that one measure is more appropriate for showing what they want to express: the number of beans most likely to be found in a group of edamame pods.

Why? The mean (or arithmetic average) is likely not to represent an actual number in a data set. As such, a mean is not the best measure for expressing data that has been organized into categories of discrete values, e.g. 1, 2, 3, 4 beans. The mode is a better choice for representing the data and for predicting what students might expect to see in other samples of edamame.

Procedure

1. **Have students review pages 16–19, in *COOLBEAN the Soybean*.**
 - a. At what stage in a soybean's life cycle does it form pods?
 - b. What are inside the pods?
 - c. What is edamame?
 - d. When we eat a soybean we eat the seed.
 - e. Why are soybeans a healthy food to eat?
2. **Show the class** a container of edamame in pods.
 - a. Ask students if they think the pods contain the same number of beans?
 - b. Select 10 beans and show them to the class. Students will see that the pods have a different number of beans. (Edamame usually has one to three beans, or seeds. Field soybean pods, however, contain one to five beans.)
 - c. Ask them to estimate the number of beans a pod is likely to contain? Do they think one number of beans is more likely to occur than another number of beans?
3. **Divide the class into pairs or small groups of students.**
4. **Distribute materials** to each group: 15 edamame pods, a paper plate, white paper, and graph paper.

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Procedure continued.

5. Each group of students will:
 - a. Hold each pod up to the light and **count the number of beans in each pod.**
 - b. **Count** the number of beans in each pod, and **record the data** in a table. Sample:

Pod #	Number of beans in each pod	Running total of beans in all pods
Pod 1	3	3
Pod 2	2	5
Pod 3	3	8
Pod 4	1	9
Pod 5	3	12
Pod 6	3	15
Pod 7	1	16
Pod 8	4	20
Pod 9	2	22
Pod 10	3	25
Pod 11	1	26
Pod 12	2	28
Pod 13	2	33
Pod 14	1	31
Pod 15	3	34

- c. **Make a frequency chart** to record (Column 1) the number of beans in each pod and (Column 2) **tally** the number of times that number occurred. Sample:

Number of beans inside the pod	Tally (total)
1	 (4 pods)
2	 (4 pods)
3	 (6 pods)
4	 (one pod)

- d. **Find the mathematical mean** (also called the **average**) of the number of beans in a pod.

$$1 \times 4 = 4$$

$$2 \times 4 = 8$$

$$3 \times 6 = 18$$

$$4 \times 1 = 4$$

$$4 + 8 + 18 + 4 = 34$$

Total number of beans (**34**) divided by pods (**15**) = **2.26** (the mean)

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Procedure continued.

- e. **Make a line plot** from the data in the frequency chart. Write the number of beans, e.g. 1, 2, 3, 4 from the frequency chart along the bottom axis of the graph, labeled "number of beans." Put an "x" for each tally in the correct box along the vertical axis, labeled "tally." (Sample below)

			x	
			x	
x	x	x		
x	x	x		
x	x	x		
x	x	x	x	
1	2	3	4	

Number of beans

- f. Interpret the line plot to **find the mode**, the number of beans that occurred the most times.

			x	
			x	
x	x	x		
x	x	x		
x	x	x		
x	x	x	x	
1	2	3	4	

Number of beans

Mode
↓

6. As a class, combine the data and repeat steps 4a–4f.

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Discussion

1. Based on the class findings, do students think they could predict how many beans per pod they would likely find in a different sample of edamame? What number of beans per pod are they most likely to find?
2. Go over the difference between mean and mode. Which measure would students use to make their predictions. Why?
3. Did graphing their data made it easier to see their results and communicate their results to others. Why?
4. Why is graphing an important skill for scientists to have?

That was some seriously cool math and science work. Wow! I am impressed!

