

Green Beans the Wonderful Fruit Using Scientific Measurement

Darwin's theory of natural selection included the observation that individuals in a population of any species vary in many inheritable traits. Darwin realized that this variation is what makes natural selection possible. Offspring will resemble, but not be identical to, each other and their parents. The variation found among species members may provide some members with a slight advantage. This advantage can lead to an increase in that variant within the population. Some of the variation within a species is measurable. For example, one tree may be slightly taller at maturity than its sibling. One dog may be milliseconds faster than its litter mate. This small speed advantage may make the dog able to catch the rabbit first, avoid starvation and thereby live long enough to reproduce. Variation is essential to the survival of a species in an ever-changing ecosystem.

PURPOSE

In this activity you will work with a partner to select the appropriate tools to make metric measurements. You will collect the data needed to determine the averages for pod length, pod mass, and pod volume of two different species of plant pods. You will then design your own data table, record the data, and generate appropriate graphs for communicating the data.

MATERIALS

balance	5-6 green bean pods
meter stick	5-6 snow pea pods
beakers of various sizes	calculator
graduated cylinders, several sizes	
metric ruler, small	

Safety Alert

Do not eat or drink in the laboratory.

PROCEDURE

PART I: VARIATIONS IN POD LENGTH

1. Design a data table in the space labeled Data Table 1 on your student answer page. Your table should include places to record the length of 6 green bean pods, the average length of green bean pods in your sample, and the class' average green bean pod length.
2. Obtain 6 green bean pods and select the tools that you will use to measure the pods' length.
3. Measure the length of the pods and record the data in Data Table 1.
4. Determine the average pod length for your sample and record it in Data Table 1.

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5. Share your average with the other groups in the class as your teacher instructs.
6. Design a data table in the space labeled Data Table 2 on your student answer page. Your table should include places to record the length of 6 snow pea pods, the average length of snow pea pods in your sample, and the class' average snow pea pod length.
7. Obtain 5–6 snow pea pods and select the tools that you will use to measure the pods' length.
8. Measure the length of the pods and record the data in Data Table 2.
9. Determine the average pod length for your sample and record the average in Data Table 2.
10. Share your average with the other groups in the class as your teacher instructs.

PART II: POD MASS

1. Design a data table in which you will record the average pod mass based on your green bean sample, the average pod mass based on your snow pea sample, and the class pod average for both types. Your data table should contain any measurements taken as you determine the average pod mass for each type of pods. This table will be Data Table 3.
2. Collect the mass data and record it in Data Table 3.
3. Share your average green bean and snow pea pod masses with the class as your teacher instructs.
4. In the space marked Graph 1 on your student answer page, construct a graph of the data found in Data Table 3. Be sure to include all of the appropriate parts of a graph.

PART III: POD VOLUME

1. Devise a method for determining the volume of each of your green bean pods. Record the steps you will follow in the small box located near Data Table 4 on your student answer page.
2. Design a data table in the space labeled Data Table 4 on the student answer page. Your table should include places to record the volume of 6 snow pea pods and 6 green bean pods, the average volume of snow pea pods in your sample and the average volume of green bean pods in your sample, and the class' average snow pea pod volume and green bean pod volume.
3. Collect the volume data and record it in Data Table 4.
4. Share your average green bean and snow pea pod volumes with the class as your teacher instructs.
5. In the space marked Graph 2 on your student answer page, construct a graph of the data found in Data Table 4. Be sure to include all of the appropriate parts of a graph.

ANALYSIS

1. What is the range of length variation for the bean pods in your sample?
2. What is the range of length variation for the snow peas in your sample?
3. Is your green bean pod length average the same as the class average? Explain the reason for your answer.
4. How much variation is there when you compare the average pod volumes in your green bean and snow pea samples to that of the class?
5. How much variation is there when you compare the average pod masses in your green bean and snow pea samples to that of the class?

CONCLUSION QUESTIONS

1. Does your green bean sample show variation in mass, length, and volume? Support your answer with data.

2. If you were told that an unidentified bean was 115 mm long, would you predict that this bean is most likely a green bean or a snow pea? Explain.

3. If you were randomly given a green bean of the same variety used in this activity, what would you predict the mass to be? Explain.