



## Dry Forest

### Concepts

Scientific Method

### HCPS III Benchmarks

SC.6.1.1

### Duration

1 hour

### Source Material

PRISM

### Vocabulary

scientific method

hypothesis

treatment

control

data

data table

bar graph

mean

median

## Lesson 4: Scientific Method

### Summary

This activity is an overview of the scientific method. This lesson will use the seed dispersal lab as an example of the scientific method as well as prepare the students for future lessons.

### Objectives

- Students will be able to understand the scientific process through the scientific method.
- Student will identify the scientific method in a previous exercise.

### Materials

*Scientific Method* Worksheet

*Scientific Method Exercise* Worksheet

*KWL* Worksheet

### Making Connections

Students will be able to connect the scientific method to the previous seed dispersal lab. The scientific method is the basis for all research and will be used in future lessons, where the students will correctly develop their own hypothesis and design their own experiment using the scientific method.

### Teacher Prep for Activity

Review the seed dispersal lab from “Lesson 3: Seed Transport” and make copies of the *Scientific Method* worksheets and the *KWL* worksheet.

### Background

#### Scientific Method

The scientific method starts by posing a question. It is necessary to gather some background information after the question is developed. Next a **hypothesis** is developed. This prediction is a testable statement, not a question (If, then statements can be used). After developing a testable hypothesis, an experiment is designed and carried out. The experiment must have a **control**, something to compare the variable to during the experiment. When the experiment is finished and data are collected, then the data are analyzed by things like **means** and **medians**. Changes over time can also be used. These data will determine if your hypothesis is correct or incorrect.



## Vocabulary:

scientific method: an organized way to answer a question; it has 6 steps

hypothesis: a predictive statement that can be tested with an experiment

treatment: the tested part of the experiment, is used to determine the effects of something

control: the normal conditions in an experiment, is what the treatments are compared to.

data: data are the information, or results, you collect during an experiment; data are used to make conclusions about the experiment.

data table: an organized way to display the data

bar graph: graphs used to visually compare data

mean: the average, used with data

median: the middle number (1,3,4,5,6,9,11,100,101; 6 is the median because it is the 5<sup>th</sup> number in either direction)

## Procedure

1. Get an update from the students to see how their brochures (introduced in Lesson 1) are coming along. Provide help and guidance as needed.
2. Hand out *KWL* worksheet and have the students fill out the first 2 questions. Then pass out the *Scientific Method* worksheet.
3. Go over the 6 steps of the scientific method, having the students follow along and fill out the worksheet (the Scientific Method Diagram has the answers).
  - Step 1: Ask a Question
  - Step 2: Do Background Research
  - Step 3: Construct a Hypothesis-a hypothesis is a predictive statement.
  - Step 4: Test the hypothesis with an experiment-most experiments have a control, which is often un-manipulated treatment category and is more “natural”
  - Step 5: Analyze the results and draw conclusions
  - Step 6: Report the results

### Activity 1: Group Discussion Series

1. Topic: Seed dispersal and Scientific Method (Hand out the *Scientific Method Exercise* worksheet and have the students fill it out as the discussion progresses.)

*Question 1:* What was the question being asked in the seed dispersal activity?

*Answer:* The general question was, “How are seeds spread or dispersed?”

*Question 2:* What was learned about seed dispersal?

*Answer:* In the last lesson, there was a section about how seeds can be spread by animals, water, wind, and explosive.

*Question 3:* What hypothesis was tested?

*Answer:* Different areas have different seeds and more seeds will be collected from one area than another area.



*Question 4:* How was the hypothesis tested?

*Answer:* This is the procedure from the experiment yesterday. Tape was attached to an ankle, and a specific “habitat” was walked through. Then seeds and other things that attached were counted.

*Question 5:* Was there a control?

*Answer:* No, this experiment was comparing two different areas. If for example, you wanted to compare the types and numbers of seeds from a fountain grass area to a dry forest, the dry forest would be your control and the fountain grass would be the “treatment,” meaning it is the variable being tested.

*Question 6:* How were the results analyzed?

*Answer:* Total numbers of things collected were compared between the different habitats from the ecosystem map. Also, seeds vs. other thing things collected were examined within each habitat.

*Question 7:* What were the results?

*Answer:* This should be their conclusions on the worksheet that they found based on their bar graphs (data).

Have the students finish filling out their *KWL* worksheet and hand it in.

## Assessments

*Scientific Method* Worksheet

*Scientific Method Exercise* Worksheet

*KWL* Worksheet

## Extension Activities

Have the students write out an experimental design using the scientific method for growing the seeds that they collected with their socks.

Example procedure:

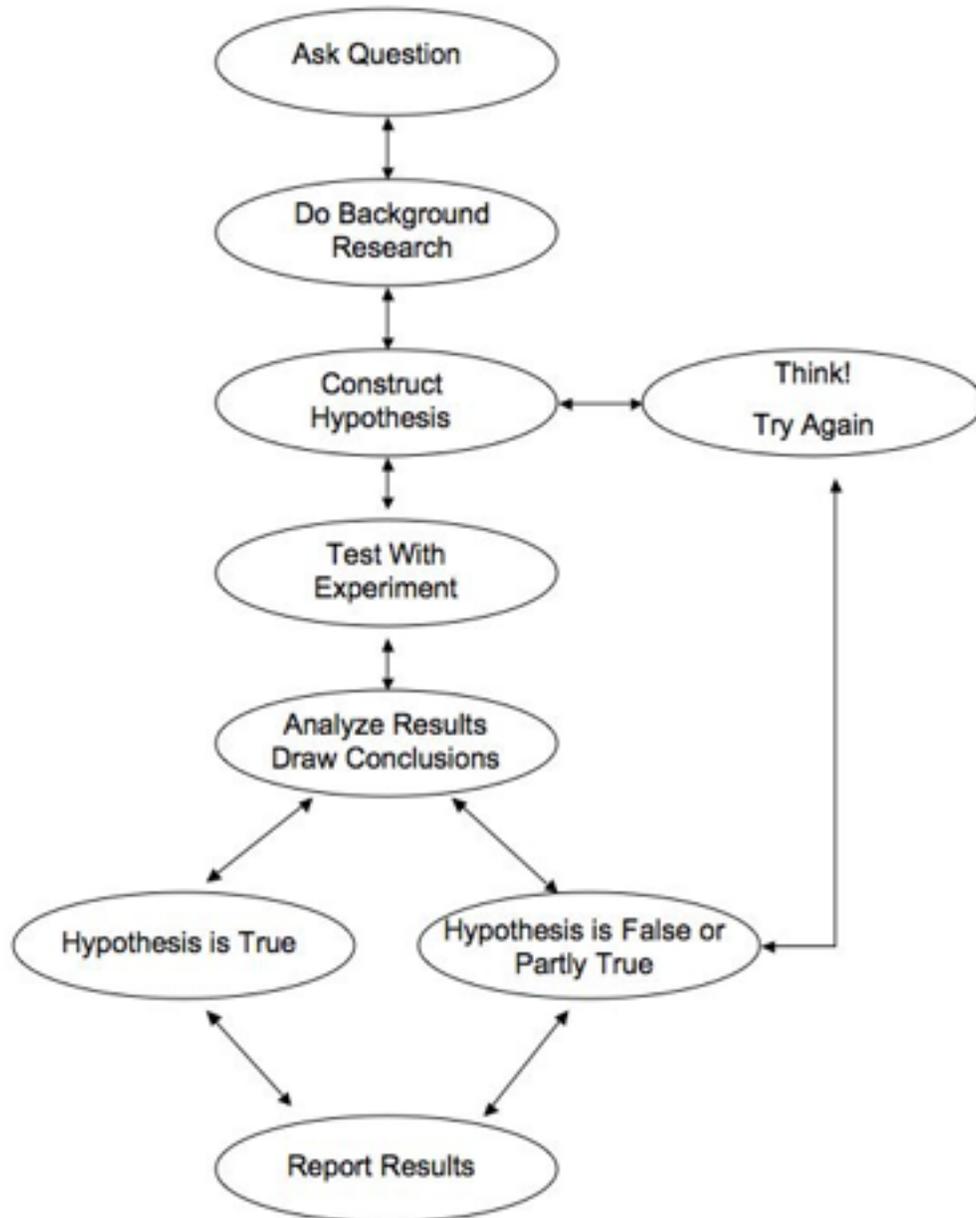
Hypothesis: Bean seeds will grow better than the rest of the seeds on the socks.

Procedure:

1. Plant 10 bean seeds and 10 other seeds, 2 in a pot. The seeds will be planted 1 cm beneath the surface of the soil.
2. The seeds will be watered daily, until the soil is moist.
3. Once the seeds germinate, the height of the plant will be measured every 3 days for 15 days.
4. The change in plant growth over time will provide a mean growth rate and will be graphed.
5. The surviving number of plants will also be graphed using bar graphs.



### Scientific Method Diagram:

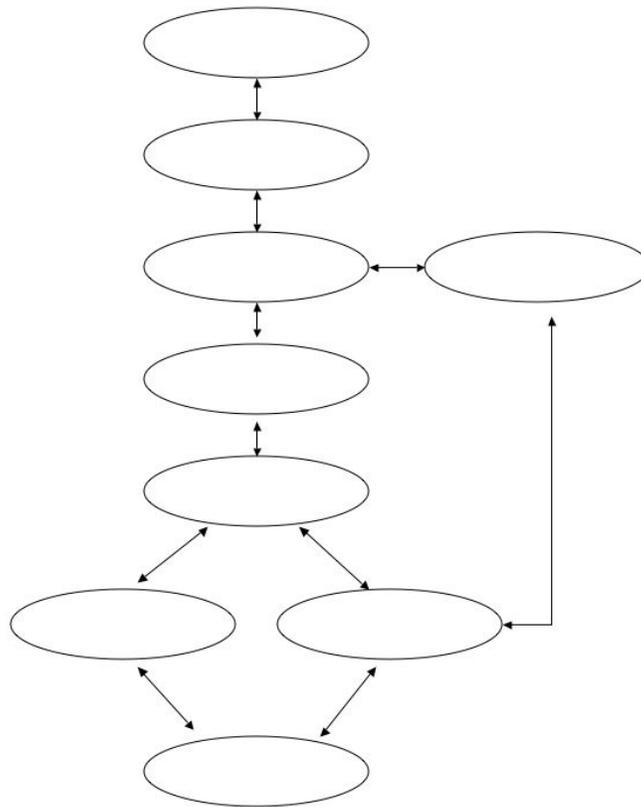




Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Scientific Method



What is a hypothesis?

What is a control?

How can you display your results?



Answers:

A hypothesis is a predictive statement. It is not a question.

A control is typically used to compare your experiment (treatment) to. It is the normal setting and should not be manipulated.

Results can be displayed in graphs and tables, like bar graphs.



Name: \_\_\_\_\_

Date: \_\_\_\_\_

### Scientific Method K-W-L

What do you know about the scientific method?

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What do you want to know about the scientific method?

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What did you learn about the scientific method?

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**Name:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**Scientific method exercise**

- 1) What was the question being asked in the seed dispersal activity?
  
- 2) What was learned about seed dispersal?
  
- 3) What hypothesis was tested?
  
- 4) How was the hypothesis tested?
  
- 5) Was there a control?
  
- 6) How were the results analyzed?
  
- 7) What were the results?