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**Understanding the Scientific Method**

**Readings**

1. **Steps of the Scientific Method**

**Baseball**

David and Eric wanted to find out which type of baseball bat would hit a baseball farther. David thought that a metal bat would hit a ball further, while Eric thought that a wooden bat would hit a ball further. They went to baseball practice to ask their coach how they could determine who was right.

The coach had each boy hit 50 balls with a metal bat and 50 balls with a wooden bat every day during practice for one week. Each day, both boys hit the ball farther when using the metal bat. “Ah Ha!” said David. “A metal bat does hit a baseball farther.”

Identify the steps of the scientific method used in the passage above.

1. What is the **problem** in this story? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. What were the **hypothesis** statements? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. Explain the **experiment** that took place. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. What was the **conclusion**? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. **Controls and Variables**

The best experiments are really just pairs of tests conducted at the same time. One test is called the **control**, an experiment where all conditions are normal or not changed. The other test, the **variable**, is like the control experiment with a factor that is changed. There are two types of variables; independent variables and dependent variables. An **Independent variable** is the factor being changed in an experiment. The **Dependent Variable** is what happens or takes place because of the changed factor. A “good” experiment has ONLY 1 changed variable. Scientists us the control experiment to compare the outcome of the variable to.

Suppose you want to answer the following question:

**Does a certain kind of plant food really help plants grow?**

First you would want to make a hypothesis and then test it. You could say “I think that the plant food will help the plants grow.” To test this you would take four identical plants, make sure that they receive the same amount of light and are at the same temperature. Put the plant food in the soil of two plants, group A, and do not add plant food to the soil of the other two plants, group B. Water group A every day and water group B every third day. After two weeks you notice that group A, watered every day and with the addition of plant food, is doing much better than group B, watered every third day and with no plant food added.

**Questions and Analysis**:

1. List the conditions that were the **same** (identical), controls, for both groups.
   1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. List the conditions that were **different**, variables, for both groups.
   1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Can you be sure that the plant food was responsible for helping the plants in group A grow? Why? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. How many **variables** are there in this experiment? Is it a “good” experiment? Why?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. What change could you make in this experiment to make sure that the plant food was responsible for helping the plants in group A grow? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. **Observations and Inferences**

Factual information collected using one of your five senses is an **observation**. You can see something, taste something, smell something, touch something or hear something. Regardless of which way you collect this information it actually occurred. The educated guess that can be based on your observation is the **inference**. This is not factual and may not even be close to the actual reason something happened.

1. Identify each of the following statements as either an observation (**O**) or inference (**I**). If the statement is an observation **identify which sense was used** to collect this information; sight, hearing, taste, touch, smell.

\_\_\_\_\_ 1. Peter is wearing a sweatshirt.

\_\_\_\_\_ 2. A skunk was just hit by a car because I can smell it.

\_\_\_\_\_ 3. Jenny just finished cooking because the stove is hot.

\_\_\_\_\_ 4. The music is loud.

\_\_\_\_\_ 5. The lemonade is sweet.

1. Use the picture below to make 3 observations and 3 inferences.

**Observations**:



**Inferences**:

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