Nature of Science

Lesson 3: Types of Investigation

Today's focus

I will:

- Explain the difference between an experiment and other types of scientific investigations.

Reading: The Types of Scientific Investigation

Scientific investigations are planned attempts to test predictions, verify results, and explain natural phenomena. There are several different methods of making scientific investigations. Although the most common methods are carrying out controlled experiments, making models or simulations of a system, observing the natural world, and conducting field studies.

A **controlled experiment** is an investigation that must have an identified control group and an experimental group. The two testable groups must have values that are kept the same for each, except for the tested variable (independent variable). An example of a controlled experiment is, *"How does the color black affect heat absorption?"*

The **control group** is the part of the experiment that remains the same in order to compare it to the variable being tested. The control is the variable that usually has the "normal" outcome, as it compares to the outcome being explored in the test variable(s). If our experiment, *"How does the color black affect heat absorption?"* used aluminum cans to measure heat absorption, the unpainted aluminum cans would be the control group.

The **experimental group** includes the variables in the experiment. The **test variable** (manipulated variable) is the variable that is changed on purpose. For example, the aluminum cans in this experiment must be painted black to test their effects on heat absorption.

The key to any controlled experiment is that the **constant variable** (controlled variables) be kept the same during the experiment. Controlling the variables ensures that any change that occurs is only because of the test variable. The controlled variables are to be kept the same for both control and the experimental (test) groups. Examples of the controlled variables is the aluminum can experiment includes same-sized cans, the same heating sources, the same thermometer, etc.

The **outcome variable** is the variable being measured in your experiment. This variable will change based on the test variable. In the above example, the outcome variable would be the amount of heat absorbed by the cans.

Given an example of a controlled experiment?

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Making models or simulation of systems is a method of investigation carried out when it is necessary to understand something too vast, too minute (small), or too dangerous to explore.

A **model** is a representation of an arrangement of some object or even in the real world. For example, it is very common to make models of the solar system to compare sizes, distances, and/or movements from one point to another.

Given an example of a model?

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Simulations are another popular means of studying systems. A simulation is an imitation of the functioning of a system or a process. An example of this is a computer simulation used to predict weather patterns.

Given an example of a simulation?

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Field studies are a method of investigation for studying plants and animals in their natural habitat. The form of observation takes place without altering or harming the organism being investigated. An example of a field study is the seasonal study of birds; migration using just a logbook, binoculars and bird books.

Given an example of a field study?

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Observations made of the natural world require descriptive details of events in nature. Specific facts are noted, including the amounts, size, colors, and other relative details and measurements. An example of systematic observation is observing and taking notes of how the phases of the moon change in the night sky over the course of the month.

Given an example of an observation?

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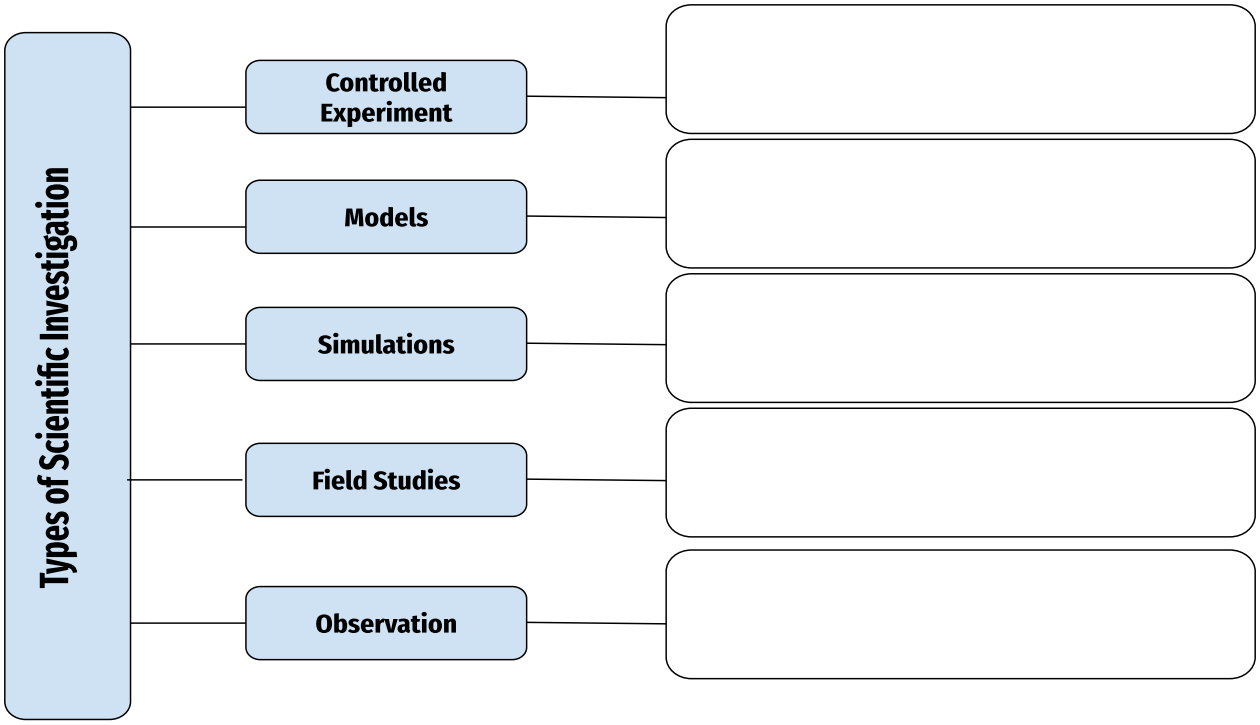
Directions: Use the passage to help provide **one example** for each of the following:



Writing Prompt:

Explain the three types of scientific investigation we talked about in class today. Create your own example of each.

Exit Ticket:

1. Christopher uses the data on several packages of cereal to find out the amount of fat in one serving of each cereal.

What **best** describes of the type of investigation Christopher is doing?

a. experiment
b. interview
c. observation
d. Survey

4. Tammy is investigating whether a person's height remains the same all day long. She is going to measure the heights of 5 of her friends at different times of the day.

What **best** describes the type of investigation Tammy is doing?

a. demonstration
b. experiment
c. interview
d. survey