

What Is an Experiment?

An experiment is a sort of test, designed to evaluate a hypothesis or theory. Science is concerned with experiments and experimentation, but do you know what exactly an experiment is? Here's a look at what an experiment is... and isn't!

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In its simplest form, an experiment is simply the test of a hypothesis.

Experiment Basics

The experiment is the foundation of the scientific method, which is a systematic means of exploring the world around you. Although some experiments take place in laboratories, you could perform an experiment anywhere, at any time.

Take a look at the steps of the scientific method:

1. Make observations.
2. Formulate a hypothesis.
3. Design and conduct an experiment to test the hypothesis.
4. Evaluate the results of the experiment.
5. Accept or reject the hypothesis.
6. If necessary, make and test a new hypothesis.

Types of Experiments

- **Natural Experiments**

A natural experiment also is called a quasi-experiment. A natural experiment involves making a prediction or forming a hypothesis and then gathering data by observing a system. The variables are not controlled in a natural experiment.

- **Controlled Experiments**

Lab experiments are controlled experiments, although you can perform a controlled experiment outside of a lab setting! In a controlled experiment, you compare an experimental group with a control group. Ideally, these two groups are identical except for one variable, the independent variable.

- **Field Experiments**

A field experiment may be either a natural experiment or a controlled experiment. It takes place in a real-world setting, rather than under lab conditions. For example, an experiment involving an animal in its natural habitat would be a field experiment.

Variables in an Experiment

Simply put, a variable is anything you can change or control in an experiment. Common examples of variables include temperature, duration of the experiment, composition of a material, amount of light, etc. There are three kinds of variables in an experiment: controlled variables, independent variables and dependent variables.

Controlled variables, sometimes called constant variables are variables that are kept constant or unchanging. For example, if you are doing an experiment measuring the fizz released from different types of soda, you might control the size of the container so that all brands of soda would be in 12-oz cans.

If you are performing an experiment on the effect of spraying plants with different chemicals, you would try to maintain the same pressure and maybe the same volume when spraying your plants.

The independent variable is the one factor that you are changing. I say one factor because usually in an experiment you try to change one thing at a time. This makes measurements and interpretation of the data much easier. If you are trying to determine whether heating water allows you to dissolve more sugar in the water then your independent variable is the temperature of the water. This is the variable you are purposely controlling.

The dependent variable is the variable you observe, to see whether it is affected by your independent variable. In the example where you are heating water to see if this affects the amount of sugar you can dissolve, the mass or volume of sugar (whichever you choose to measure) would be your dependent variable.

Steps of the Scientific Method

Experimentation is how you test a hypothesis in the scientific method. Experiments can be simple or complex. What matters is that you can control and measure your variables.

The scientific method is a method for conducting an objective investigation. The scientific method involves making observations and conducting an experiment to test a hypothesis. The number of steps of the scientific method isn't standard. Some texts and instructors break up the scientific method into more or fewer steps. Some people start listing steps with the hypothesis, but since a hypothesis is based on observations (even if they aren't formal), the hypothesis usually is considered to be the second step.

Here are the usual steps of the scientific method.

Examples of the Null Hypothesis

- Hyperactivity is unrelated to eating sugar.
- All daisies have the same number of petals.
- The number of pets in a household is unrelated to the number of people living in it.
- A person's preference for a shirt is unrelated to its color.

Examples of an If, Then Hypothesis

- If you get at least 6 hours of sleep, you will do better on tests than if you get less sleep.
- If you drop a ball, it will fall toward the ground.
- If you drink coffee before going to bed, then it will take longer to fall asleep.
- If you cover a wound with a bandage, then it will heal with less scarring.