

**Purpose:** To learn the basic components of a controlled experiment.

**Guiding Questions:**

- How is a controlled experiment conducted?
- What is the purpose of the dependent and independent variable?

### Why do scientists conduct controlled experiments?

A controlled experiment is done to determine what affect or impact an independent variable has on a dependent variable. For example, a scientist may want to know what impact watching TV has on a student's grade. Controlled experiments are done to see the cause-and-effect relationship between two things.

*Remember, the dependent variable is what we measure to see if there is any change. The independent variable is what we do to try and cause change. For example, we could try to see how Gatorade affects how fast a person runs. The Gatorade would be the independent variable (because we can to see if it will cause a change) and the speed the person runs would be the dependent variable (because we want to see if that is changed by the independent variable).*

### How is a controlled experiment done?

To do a controlled experiment a scientist will make two groups: the control group and the experimental (or treatment group). Both groups have everything in common with the exception of the independent variable. This means that there is only one difference between the two groups. Why? The scientist wants to see if that one difference causes any impact on the dependent variable. If we have too many differences, the scientist will have trouble deciding what caused the change.

Typically, the control group has nothing done to it. It exists to compare the results of the experimental group. For example, in our inquiry on the butterfly and food color, we had one container of nectar with no color added to it. Why? We want to see the affect of color on the butterfly's food preference. By not adding to or adjusting the color of the nectar, we can more easily conclude if the color added to the other containers had any influence over what the butterfly would normally consume.

Ultimately, a scientist will design a controlled experiment so they can measure the impact the independent variable has on the dependent variable.

On the back of this sheet are some practice questions about how to do a controlled experiment.

**Practice.**

1. On the Mythbusters an experiment was done to see how music affected the growth of plants. The Mythbusters took several plants. One plant had no music played to it. Another plant had classical music played to it, another had rock played to it, and another plant had pop music played to it.
  - a. In this experiment, what was the independent variable?
  - b. In this experiment, what was the dependent variable?
  - c. In this experiment, what was the control group?
  - d. In this experiment, what were the experimental groups?
  
2. You notice one day that salt water takes longer to freeze than fresh water. To see if this is true, you decide to conduct a controlled experiment. The question would be "how does salt affect the time it takes water to freeze?"
  - a. For this experiment, what would be the independent variable?
  - b. For this experiment, what would be the dependent variable?
  - c. For this experiment, what would be the control group?
  - d. For this experiment, what would be the experiment group(s)?
  - e. How would you do this experiment? Write a few sentences that describe what this experiment would look like (how it would be done).