

Most science investigations require a controlled experiment. A **controlled experiment** is an experiment in which only one variable is tested at a time.

Investigations will often refer to both an independent and dependent variable. Independent and dependent variables are related to one another.

The **independent (or manipulated) variable** is the variable that you, the experimenter, change or manipulate intentionally.

Dependent (or responding) variable is the variable that changes when the independent variable changes. The dependent variable depends on the outcome of the independent variable.

Here are some simplified examples:

Question	Independent Variable	Dependent Variable
Does water help plants grow best?	Type of liquid (water, vinegar, etc)	Height of plant (in cm)
What kind of teaching helps kids learn best?	Type of instruction (reading, lecture, video, lab)	Score on test
Does the form of sugar affect how quickly it dissolves?	Form of sugar (granulated, powdered, cube)	Time to dissolve (in seconds)

With each of these experiments, it is very important to control the experiment. Question 1: You **ONLY** want to test the **TYPE** of liquid. Imagine you watered one plant with water every day and another plant with vinegar every other day. If you found the plant given vinegar grew less tall, you wouldn't know if it is because of the type of liquid or the frequency of which you watered the plant. There are **TOO MANY VARIABLES**. Kids will relate to this being a "fair" comparison or not. In this investigation, the following variables must be kept the same between the two plants: the type of plant, size of container, amount of sunlight each day, temperature, amount of liquid, how frequently the plant is watered... etc. These variables that are kept the same are called **controlled variables**.

Of course, we cannot control everything in an experiment. We may have the same types of plant, but one seed was not as robust. Perhaps when we planted the seed, one seed was slightly deeper in the pot than the other. These types of control mishaps constitute "experimental error."

http://www.curriki.org/xwiki/bin/view/Coll_cmytko/VariablesDependentandIndependentandControls?bc=;Coll_cmytko.ARefresheronthePrinciplesofScientificInquirytheScientificMethod