

Testable Question



A testable question is one that can be answered by designing and conducting an experiment.

The answers to a testable question can be observed and measured.

Hypothesis

- Hypothesis- a testable explanation of an observation.
- A hypothesis is NOT just an educated guess about what you think will happen. It must be based on research AND be able to be tested!



Elements of a Hypothesis

A hypothesis should:

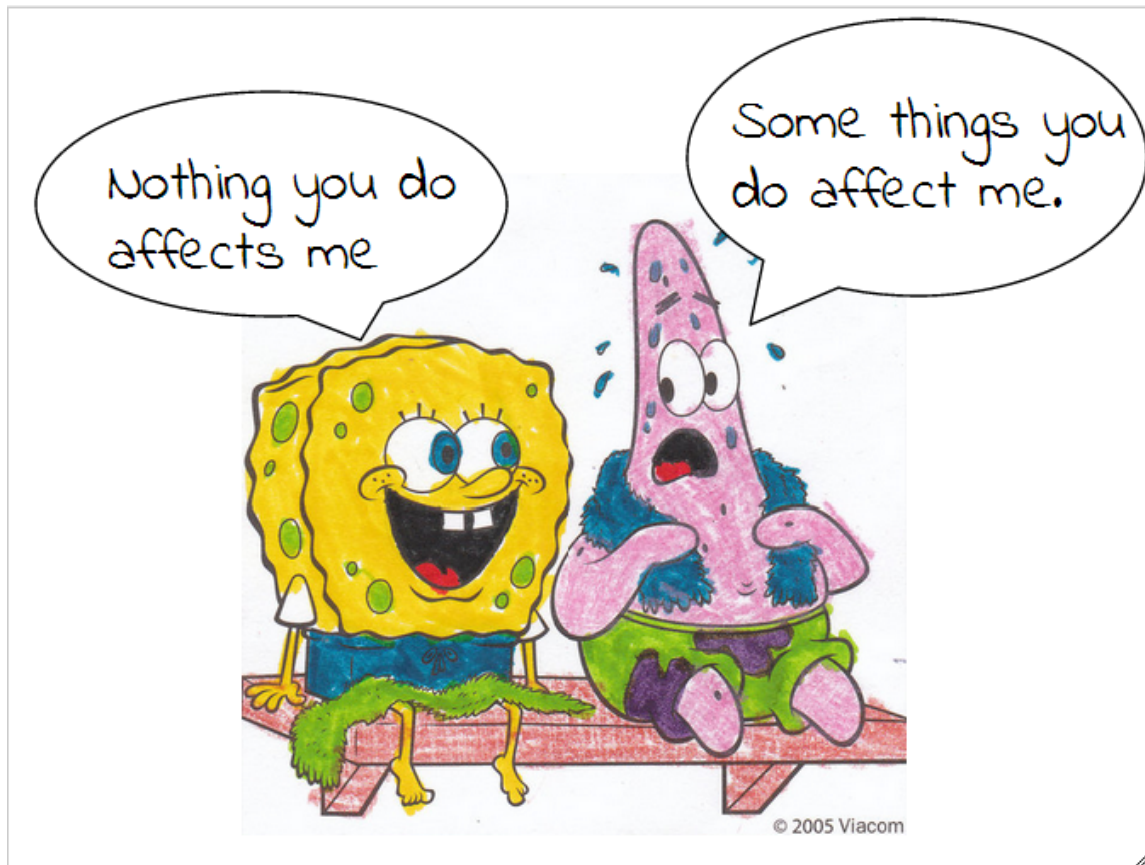
- Define the proposed relationship between the variables.
- Worded so it can be tested
- Make a clear prediction
- Be specific

Variables & Controls

- A **variable** is anything that ***changes*** in a scientific experiment.
- The **control** is what you use to ***compare*** the results to in the end of the experiment.

There are 2 types of variables:

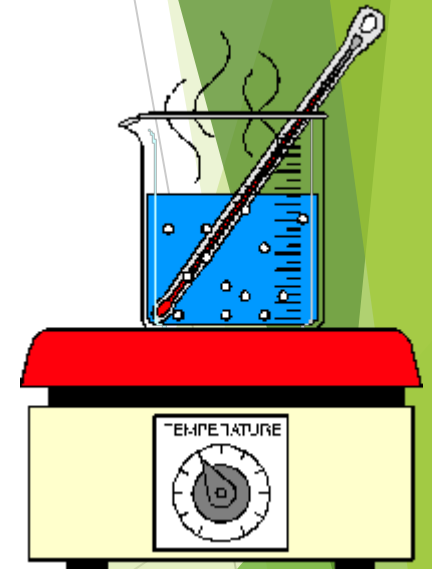
- Independent (also known as manipulated)
- Dependent (also known as responding)



Independent Variable

Independent Variable: The variable that is intentionally changed in the experiment, such as the temperature of the water in which an effervescent tablet is dissolved.

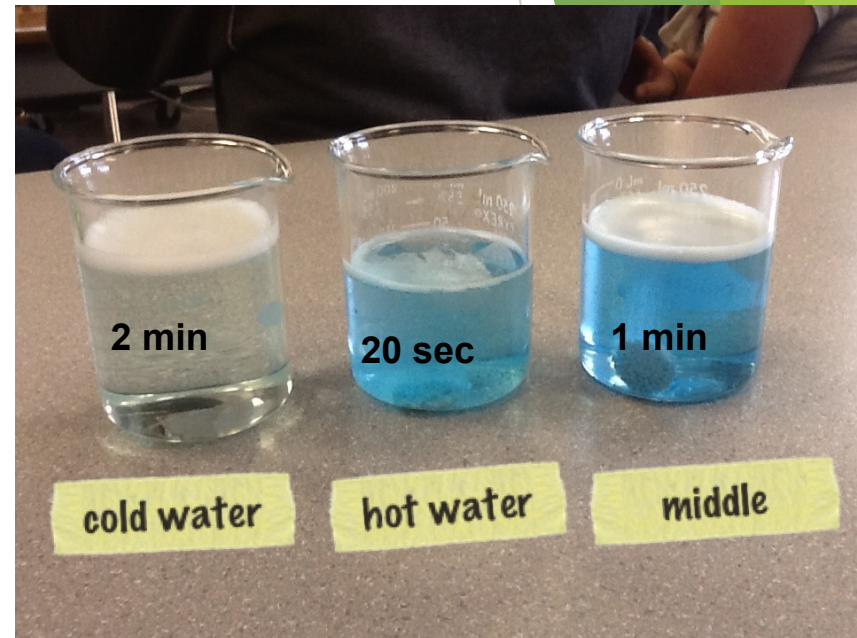
- Cause
- a.k.a Manipulated Variable
- Graphed on x axis



Dependent Variable

Dependent Variable: the variable that responds to the changes in the independent variable. For example, the **time it takes** for effervescent tablets to dissolve in three different temperatures of water is the dependent variable.

- Effect
- a.k.a Responding Variable
- Graphed on y axis



Independent Variable vs. Dependent Variable



	Independent Variable	Dependent Variable
Also Known As:	Manipulated Variable	Responding Variable
Results:	Cause	Effect
On a graph:	X axis	Y axis

Controlled Variables

Controlled variables (AKA constants) are the things that are kept the same each time one of the trials in the experiment is repeated.

For example, constants could include the amount of water used, the brand of effervescent tablet used, the type of water used, and the fact that the water was not stirred. As many outside factors as possible should be kept constant in an experiment so that the researcher can be sure that any changes that occur do so because of the independent variable.

Control Group

The standard against which the researcher compares the results from each treatment group in the experiment.

For example, the control might be the room temperature water, which is about 20° C.

In many cases, there will not be a true control. The researcher could then set one of the groups as the standard and measure the other groups against that standard.



Types of Variables

Independent

The one thing you change.
Limit to only one in an experiment.

Example:
The liquid used to water each plant.

Independent Variable



Dependent

The change that happens because of the independent variable.

Example:
The height or health of the plant.

Dependent Variable

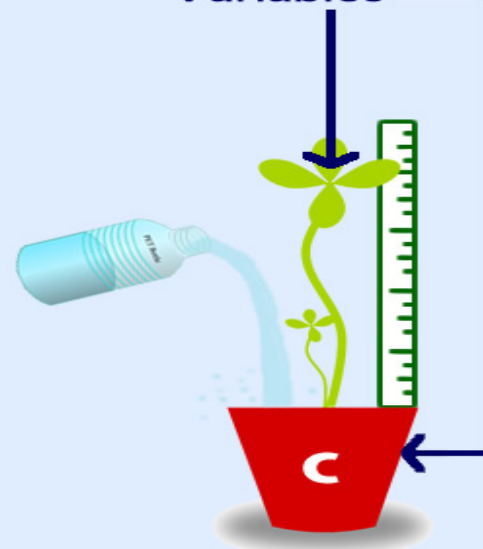


Controlled

Everything you want to remain constant and unchanging.

Example:
Type of plant used, pot size, amount of liquid, soil type, etc.

Controlled Variables



Using variables to write a hypothesis

If fertilizer helps grow larger plants, and a plant is given fertilizer, then it will be larger than a plant that does not receive fertilizer.

- States the relationship between the variables
- Manipulated variable
- Responding variable