

## ***WHAT MAKES A GOOD EXPERIMENT?***

An **experiment** is a controlled procedure designed to test a hypothesis. There are several parts to any good scientific experiment.

A good experiment is one that is:

Interesting, Important, Organized, Valid, Repeatable

### **HYPOTHESIS:**

A valid hypothesis includes the property which is changed (the cause or the independent variable) and the property which is measured (the effect or dependent variable) which may change as a result. In a good experiment, there is only one cause for the effect.

*Example: Increasing the amount of light (cause) increases a plant's height (effect). (Light affects height)*

Both of these properties can be measured. When they are graphed the independent variable is placed on the bottom (x) axis, and the dependent variable is placed on the side (y) axis.

**INDEPENDENT VARIABLE:** This is the factor, or variable that you change. This is the physical property that you have direct control over to change. It should be the **ONLY** difference between the two groups for it to be a good experiment. It is the **CAUSE** property mentioned in the hypothesis.

*Example: the amount of light.*

**DEPENDENT VARIABLE:** This is the factor, or property that you measure for, or the result. It could be different between the groups, or it could be the same. You don't know the value of this variable until the end of the experiment. This is the **EFFECT** property mentioned in the hypothesis.

*Example: how high the plant grows, the height*

**CONSTANTS/CONTROLLED EXPERIMENT:** All other properties and factors should be the **SAME** in all groups, or they should be **CONTROLLED**.

*Example: the amount of food, the amount of air, the type of plant, are all kept the same.*

**A CONTROL GROUP** is the group that is used as the basis for comparison. It could be: the **BEFORE** part of a before and after experiment (mixing two chemicals to see a color change, the control group is the setup before they were mixed). It could be: the "normal", or it could be the group in which the value of the independent variable is zero.

*Example: a plant set in a room with no light bulb.*

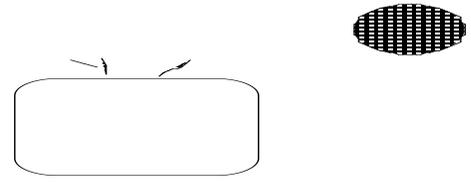
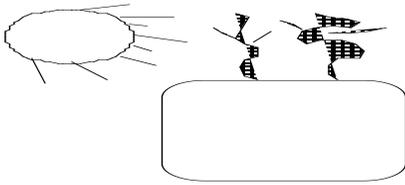
**EXPERIMENTAL GROUP (S):** The experimental group differs from the control group in just **ONE** factor or variable. This is the group that is usually mentioned in the prediction. It can also be the "after" part of a before and after experiment. It is the actual physical set of objects that you have changed or are doing something to. A good experiment usually has at least two or three experimental groups, or data points.

*Example: a plant set in a room with twenty light bulbs.*

**CONCLUSION:** after organizing the results of the observations made in the experiment, you check to see whether you are right by stating whether your predictions came true, and what you found out about the hypothesis.

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## EXAMPLE



Amount of light (IV) affects how high plant grows (DV)

A good experiment, besides having careful observations, and using instruments, will always have a control group to compare to. It is also very important to have groups in which only ONE property or variable is changed at a time, so that you can be sure that the property is the cause of whatever effect you are measuring.

### Amount of Light

1 foot candle

2 foot candle

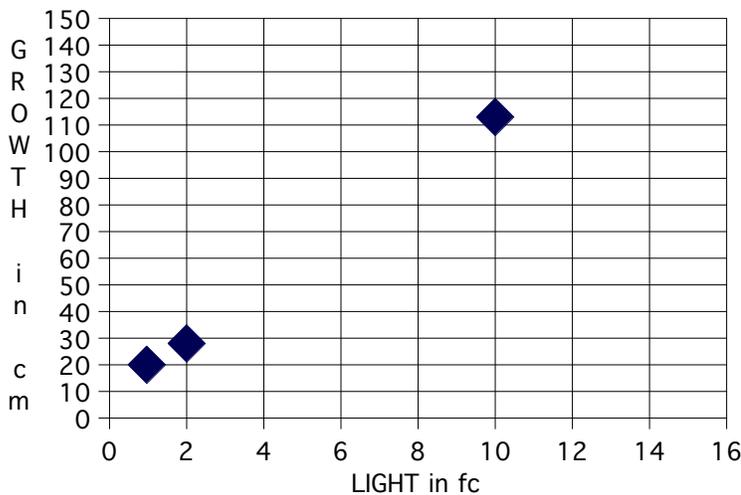
10 foot candles

### Average Height of plant after 24 hours

(19 cm, 20cm, 21 cm) 20 cm

(30 cm, 25 cm, 29 cm) 28 cm

(110 cm, 113 cm, 119 cm) 114 cm



To determine the relationship, a student could find a "best fit" line or curve.

$Y = 2X + 10$ , so with NO light, the plant would be at 10 cm (Control Group = Y Intercept)

If there is more than one independent variable, bad experiment = Not a Function!