EXPERIMENT PARTS

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

HYPOTHESIS: The educated guess, or conclude part of observe, organize, and conclude. Usually it is stated as how one physical property affects another physical property.

example: I think that the amount of light causes plant growth. (Light affects height)

PREDICTION: This is what you think is going to happen in your particular experiment, based on the hypothesis. A hypothesis can usually be tested in many ways, so it is important to predict for your specific experiment. A prediction usually indicates how you are going to MEASURE each of the properties

example: I think that a plant growing in dark will be shorter than one in the light.

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*

All other variables/properties should be the SAME in all groups, or they should be CONTROLLED.

example: same type of plant, same amount of water, same type of soil, same air type.

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 should 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.

example: a plant set in a room a very small or lots of 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

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, even though it is not always clear which is the control or "normal" group, and which is the experimental group. But 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.

EXPERIMENT EXPLANATION

HYPOTHESIS:

One property affects/causes another property.

(factor, stimuli, characteristic, measurement, observation, etc..), both can be observed/measured.

CAUSE	and	EFFECT
Independent Variable	and	Dependent Variable
~~*"Control Variable"*~~		*Measured Result*
"Manipulated"		*"Responding"*
Input		*Output*

All other properties remain the same, they are "controlled" between the experimental groups (one of which is the control group).

A "VALID" experiment is one that assures that the result output (dependent variable) is due to the input (independent variable), not to any other factor.

It also has a starting point/setup to compare to, the "control group".

OPEN ENDED ACTIVITIES (CAPT), ask students to design good experiments, with a cause and effect. (or to determine which cause has the greatest effect, and what the trend there is).

The Math/Science Connection

Independent Variable Dependent Variable

Both can be a measured property.

In Algebra terms:

Independent Variable is the cause, the X Dependent Variable is the effect, the Y.

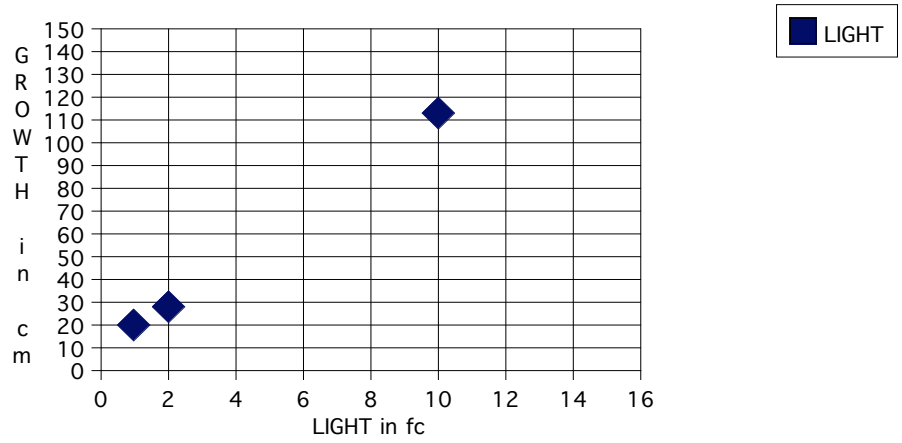
These can be stated as a qualitative or quantitative value. The relationship could be expressed as a bar graph, scatter plot, or "line" graph. (x-y line graph in Excel")

Y is a FUNCTION of X. How light affects plant growth could be:

No Light, plant is little Some light, plant is normal. Lots of light, plant is big

OR:

Light:	Height
1 fc	20 cm
2 fc	28 cm
10	114 cm



To determine the relationship, a student could find a "best fit" line or curve. Y= 10X + 10 , so with NO light, the plant would be at 10 cm (Control Group= Y Intercept, when x=0)

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

So CAPT: Designing an experiment to find the trend or relationship between one physical property (the cause) and another (the effect), with an appropriate control group is identical to:

finding the relationship between the independent variable (x) and dependent variable (y) of a function, with the y intercept.