



## The Scientific Method

### 1. Defining the problem

-the problem is typically phrased as a question.

Ex. What is the effect of Miracle Grow on plant growth?

### 2. Perform background research

-research plans should begin with a thorough library search and literature review.

-background research is done so that the researcher has a thorough understanding of the major concepts being investigated.

-also to determine whether this experiment has been performed before.

### 3. Form a hypothesis

-predictions based upon both research and observation.

-must predict a cause and effect that may be tested.

-experiments cannot prove a hypothesis; they can only support or fail to support it.

-hypotheses are written as statements that begin with "It is hypothesized..."

Ex. It is hypothesized that adding Miracle Grow to plants will cause them to grow taller.

### 4. Set up a controlled experiment

An experiment is a series of trials or tests designed to support or refute the hypothesis.

**Dependent Variable:** what are you measuring in the experiment?

Ex. The plant growth in centimeters.

- when graphing, this variable is always plotted on the "Y" axis

**Independent Variable:** are factors that influence the dependent variable. This is the variable that you are manipulating or changing.

Ex. The amount of Miracle Grow used or how often it is added.

-when graphing, the independent variable goes on the "X" axis.

**Control:** is an established reference point used as a standard of comparison. This allows you to make valid conclusions.

-the control group does not receive the experimental variable.

Ex. a group of identical plants, grown in identical conditions, which do **NOT** receive *Miracle Grow*. Therefore, you can conclude that any difference between the experimental and control groups is due to the *Miracle Grow*.

#### 5. Collect data

-data refers to the results of trials, or tests, completed during the experiment.

-data can be organized into graphs, tables, charts and equations.

#### 6. Results

-this involves the ability to look at relationships between the predicted result contained in the hypothesis and the actual result.

#### 7. Drawing valid conclusions:

-has the hypothesis been supported or refuted.