

MAKING & WRITING PREDICTIONS

Source:

<http://www.accessexcellence.org/21st/TL/filson/writhypo.html>

Purpose: to learn when and how to write hypotheses.

Most students believe that they are going to be experimenting anytime they are given a laboratory assignment in science. However, more often than not, students are doing something other than experiments. This is not necessarily bad. A good deal of science is observational and descriptive. For example, the study of bio-diversity usually involves looking at wide variety of specimens and maybe sketching and recording their unique characteristics. However, there are other times when we science teachers are trying to teach students how scientists work and how we can verify things which others may say or believe is so without any proof.

To learn about what is not known or to verify a notion, the so-called "scientific method" might be carried out and an actual experiment may be conducted. It does not matter that your experiment has been done a thousand times before or that your teacher already knows the results. What matters is that you don't know the results and that you can independently find a verifiable answer. In real experiments, real hypotheses should be written before the actual experiment.

What Is a Real Hypothesis?

A hypothesis is a tentative statement that proposes a possible explanation to some phenomenon or event. A useful hypothesis is a **testable** statement which may include a prediction. A hypothesis should not be confused with a theory. Theories are general explanations based on a large amount of data. For example, the theory of evolution applies to all living things and is based on wide range of observations. However, there are many things about evolution that are not fully understood such as gaps in the fossil record. Many hypotheses have been proposed and tested.

When Are Hypotheses Used?

The key word is **testable**. That is, you will perform a test of how two variables might be related. This is when you are doing a real experiment. You are testing variables. Usually, a hypothesis is based on some previous observation such as noticing that in November many trees undergo color changes in their leaves and the average daily temperatures are dropping. Are these two events connected? How?

Any laboratory procedure you follow without a hypothesis is really not an experiment. It is just an exercise or demonstration of what is already known.

How Are Hypotheses Written?

1. Chocolate may cause pimples.
2. Salt in soil may affect plant growth.
3. Plant growth may be affected by the color of the light.
4. Bacterial growth may be affected by temperature.
5. Ultra violet light may cause skin cancer.
6. Temperature may cause leaves to change color.

All of these are examples of hypotheses because they use the tentative word "may.". However, their form is not particularly useful. Using the word may does not suggest how you would go about proving it. If these statements had not been written carefully, they may not have even been hypotheses at all. For example, if we say "Trees will change color when it gets cold." we are making a prediction. Or if we write, "Ultraviolet light causes skin cancer." could be a conclusion. One way to prevent making such easy mistakes is to formalize the form of the hypothesis.

Formalizing The Form Of The Hypothesis

Formalized Hypotheses example: **If** skin cancer is **related** to ultraviolet light , **then** people with a high exposure to uv light will have a higher frequency of skin cancer.

If leaf color change is **related** to temperature , **then** exposing plants to low temperatures will result in changes in leaf color.

Notice that these statements contain the words , **if** and **then**. They are necessary in a formalized hypothesis. But not all if-then statements are hypotheses. For example, "If I play the lottery, then I will get rich." This is a simple prediction. In a formalized hypothesis, a tentative relationship is stated. For example, if the frequency of winning is **related** to frequency of buying lottery tickets. "Then" is followed by a prediction of what will happen if you increase or decrease the frequency of buying lottery tickets. If you always ask yourself that if one thing is related to another, then you should be able to test it.

Formalized hypotheses contain two variables. One is "independent" and the other is "dependent." The independent variable is the one you, the "scientist" control and the dependent variable is the one that you observe and/or measure the results. In the first example above the **dependent variable is leaf color change** and the **independent variable is temperature**.

The ultimate value of a formalized hypothesis is it forces us to think about what results we should look for in an experiment.

Rewrite the first four hypotheses using the formalized style shown above. Single underline the dependent variable and double underline the independent variable in the If clause of each hypothesis. When you are done, write one more original hypothesis of your own using this form.

Rewrite the first four hypotheses using the formalized style:

Your original hypothesis:
