MONDAY MORNING SCIENCE BLAST
Problem Chain - Science Processes - Hypothesizing

If someone were to ask the question, “Can you tell how old I am?” the answer to that question would be a guess. However, if the question was, “What do you think would happen if I put this flower seed in some soil and watered it regularly for three months?” the answer to that question would be a hypothesis. Sometimes a hypothesis is described as an educated guess. That's not really the same thing as a guess nor is it a good description of a hypothesis. A hypothesis is not an educated guess. Instead, a hypothesis is a possible explanation for an observation or a phenomenon, or a scientific problem that can actually be tested for further investigation. Once the investigation has been completed and the hypothesis in question has been proven, then that becomes part of scientific theory.

A hypothesis (from the Greek *ὑπόθεσις*, “to suppose”) is a proposed explanation for an observable phenomenon. Good science requires that a hypothesis must be able to be tested in order to be presented as a scientific hypothesis. Scientists generally base their scientific hypotheses on previous observations that cannot be satisfactorily explained with the available scientific theories. A hypothesis doesn’t have to be wrong or right; however, the person formulating the hypothesis has to be prepared to test their theory to its limits. As an example, if someone were to hypothesize that exposure to X causes Y in lab rats, then he or she must be ready to experiment and find out if exposure to other things also causes Y.

Sometimes a hypothesis turns out to be wrong, which in the scientific world is still considered to be perfectly acceptable, as it furthers the cause of science. In the example, by showing that exposure to X does not cause Y, a scientist can illustrate that further research on Y is needed. In addition, the fact that the hypothesis was wrong doesn’t necessarily mean substance X is safe, because substance X could still cause something else! In this lab, your students will work to discover how the scientific method helps to find an answer to a problem.

First have your students cut 15 strips of paper (l.0 cm X 15.0 cm) from the notebook paper. They are to join the paper strips to make a chain that is connected forming a circle, then use this paper chain to solve the problem listed in the Procedure section. Once that has been accomplished, they are to answer Questions 1 and 2. Next, using their scissors and tape, your students are to cut and retape their paper strips to see if their hypothesis was correct, recording the actual number of “cut-and-retapes” it took to solve the problem. Finally, instruct your students to answer questions 3 and 4.

Forming hypotheses is an important work of science. Being able to construct a test to verify the hypothesis and then evaluate fairly and honestly the outcome of the test is just as important. When teaching science by doing science, open-ended activities are best. The more the students can be involved in developing hypotheses to explain phenomena or to answer questions, the better.

Problem Chain

QUESTION: How does the scientific method help find an answer to a problem?

MATERIALS:

notebook paper
transparent tape
scissors

PROCEDURE:

1. Cut 15 strips of paper (l.0 cm X 15.0 cm) from the notebook paper.
2. Join the paper strips to make a chain that is connected forming a circle.
3. Use the paper chain to solve this problem:

   How can you separate the paper chain into 5 parts if part 1 consists of 5 rings, part 2 consists of 4 rings, part 3 consists of 3 rings, part 4 consists of 2 rings and part 5 consists of 1 ring?

   To make these parts, you can cut and retape the rings anywhere you want. Each time you cut and retape a ring, it counts as one "cut-and-retape." Your goal is to make the least number of "cut-and-retapes" possible.

   What is the smallest number "cut-and-retapes" you need to separate the rings into the 5 parts? Record this hypothesis in **DATA**. **BEFORE YOU CUT, CONTINUE TO PROCEDURE 4.**

4. Answer Questions 1 and 2.
5. Using your scissors and tape, cut and retape your paper strips to see if your hypothesis was correct. Record the actual number of "cut-and-retapes" it took to solve the problem.
6. Answer questions 3 and 4.

DATA: Hypothesis # of "cut-and-retapes": _____

Actual # of "cut-and-retapes": _____

QUESTIONS:

1. This investigation began with observations and then a problem was presented. What was the problem?

2. What is your hypothesis regarding this problem?

3. Do your experimental results support your hypothesis? If not, why not?