

Writing a Testable Hypothesis

You already know that the scientific method provides an organized way to investigate a question. Once you have a question that you want to investigate and have done some research on it, the first step in the scientific method is to express that question in terms of a hypothesis. A hypothesis is a tentative statement that proposes a possible explanation to some phenomenon or event. A hypothesis is often stated as a condition (if) and a result (then).

Example: If I add fertilizer to my plants, then I will get more flowers.

A hypothesis is a prediction about what you think will happen *if* you try the condition. A good hypothesis must be *testable*. A hypothesis must be written carefully so that you can measure both the condition and the result. Is the example hypothesis testable?

A hypothesis is testable if you can create a *controlled* experiment that will give you more information. This hypothesis is testable because you can experiment with two groups of plants of the same species. One group would get a measured amount of fertilizer, like one tablespoon, on a regular schedule and the other group of plants wouldn't get any fertilizer. Then at the end of the experiment you can measure, or count, the number of flowers on the plants in each group.

An untestable hypothesis: "If I eat more protein, my muscles will be stronger."

There are two reasons why this is not a well-defined hypothesis. If you tried to design an experiment from this hypothesis, there is no control group to compare to. Second, "get stronger" can't be measured. Think of some ways that you could measure "get stronger." Did you think of lifting heavier weights, running further, or doing more pull-ups? These are three different ways of measuring strength in a human.

Consider each topic below, then:

- (1) write a testable question related to the topic using the formula:

How does _____ affect _____?

- (2) identify the independent and dependent variable.

- (3) compose a hypothesis related to your question using the formula:

IF the **independent variable** changes in this way, *THEN* the **dependent variable** will do *this*, *BECAUSE* of **this reason**.

The first topic has been completed for you as an example.

1. Sunlight waking you up in the morning

Testable question: *How does the amount of sunlight in my room affect the time at which I wake up in the morning?*

Independent variable: *amount of sunlight*

Dependent variable: *the time I wake up in the morning*

Hypothesis: *If there is more sunlight in my room early in the morning, then I will wake up earlier because I have trouble sleeping when my room is full of light.*

2. Springtime rainfall and the emergence of dandelions

Testable question: _____

Independent variable: _____

Dependent variable: _____

Hypothesis: _____

3. Insect populations and insectivorous bat populations

Testable question: _____

Independent variable: _____

Dependent variable: _____

Hypothesis: _____

4. Freckles appearing on your face in the summer

Testable question: _____

Independent variable: _____

Dependent variable: _____

Hypothesis: _____

Name: _____

Practice with Hypotheses

Write a testable hypothesis for these situations. Draw a single underline under the independent variable and a double underline under the dependent variable.

1. Mom and I were baking a cake for my brother's birthday. We didn't have any baking powder. The recipe said to add one teaspoon of baking powder to the cake batter. Since that's such a small amount we baked the cake anyway. We were very disappointed when the cake came out of the oven flat instead of fluffy. We think maybe we needed to add the baking powder.

2. The Acme Cleansers Company wants to do some advertising for its new anti-bacterial kitchen cleaner. The advertising executives want to run some tests that show that their new product is better than the bestselling brand of kitchen cleaner.

3. Your class is in charge of filling the bird feeders at the Nature Center at your school. You notice that the nuthatches seem to prefer to eat at the sunflower seed feeder more than they stop at the mixed seed feeder.

4. Will works for a greenhouse in his local town. He learned how to conduct a controlled experiment in his science class. He decides to practice this newly gained scientific knowledge and design a controlled experiment that deals with the proper conditions to grow seeds.

5. Biologist Bill is planning to conduct a long term study dealing with the preferred habitat of earthworms. Before beginning the experiment Bill writes the following investigative question. After reading the investigative question, write a hypothesis, identify the controlled variables and variable being tested in the experiment.
Investigative Question: What habitat will an earthworm prefer?

Name: _____

Answers

If you don't add baking powder when you are making a cake from a recipe, then the cake comes out flat.

If you use the recommended amount of the new cleaner and the leading product, there will be fewer bacteria left after cleaning with the new cleaner.

If nuthatches have a choice between mixed seed or sunflower seeds, they prefer to eat sunflower seeds.