

Module: Science

Lesson Title: Formulating a Hypothesis

Objectives and Standards

Students will:

- Identify the reason for creating a hypothesis
- Identify the different types of hypotheses
- Create an effective scientific hypothesis

Science Content 2014 GED® Assessment Targets	Science Practices 2014 GED® Assessment Targets
Identify and refine hypotheses for scientific investigations. (SP2.b)	Comprehending Scientific Presentations (SP.1) Investigation Design (Experimental and Observational) (SP.2)

Materials

- Sample scenarios and general hypothesis statements

Instructional Plan

Overview

In this lesson, students will become familiar with the steps for writing a scientific hypothesis.

Process

Begin the lesson by asking students to define the word hypothesis. Have students share their definitions.

Share with students that one of the most important skills a scientist has is the ability to write a good hypothesis. Discuss that the ability to write a hypothesis is a skill that will be used throughout science, as well as on the GED® Science module. Provide students with information on the types of hypotheses, as well as a step-by-step process on how to write a hypothesis.

Here are the basic steps. A hypothesis is an educated guess or proposition that attempts to explain a set of facts or natural phenomenon. It is used mostly in the field of science, where the scientific method is used to test it.

The goal of a hypothesis is to state the purpose of the research or study and identify what variables are used. In order to be a good hypothesis that can be tested or studied, a hypothesis:

- Needs to be logical
- Must use precise language
- Should be testable/validated with research or experimentation

There are three basic types of hypotheses: the *general hypothesis*, a *specific hypothesis*, and a *measurable hypothesis*. The *general hypothesis* states the general relationship between the major variables. The *specific hypothesis* fills in important details about the variables given in the hypothesis. The *measurable hypothesis* refines the specific hypothesis by stating the direction of the difference or nature of the relationship.

A hypothesis is usually written in a form where it proposes that if something is done, then something else will occur. To write a hypothesis:

- Identify what the problem is. If you fail to identify the problem, you most certainly will have difficulty writing the hypothesis.
- Make an educated guess as to what direction of the relationship or difference is.
- Identify the major variables.
- The format for writing a hypothesis is . . .
 - If (variables),
 - Then (predict the outcome of the experiment using the dependent variable).

Model for students how to write a hypothesis using the “if, then” format. Share with students an observation, such as:

- Chocolate may cause acne.

Turn the observation into a scientific hypothesis statement that is measurable:

- *If* a person’s frequency of acne is related to the amount of chocolate a person consumes, *then* the frequency of acne will be 25% higher when subjects consume large amounts of chocolate (5 chocolate bars per day) than when subjects consume little or no chocolate.

As a group, create hypothesis based on sample observations/general hypotheses. Have students use the “if, then” style and include a measurable prediction. A few sample items from which to develop scientific hypothesis are:

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

Have students review each other’s scientific hypothesis. Have students determine whether each hypothesis includes a measurable prediction about results. Students should check that they avoid phrases like: better than, bigger than, a little more than, sometimes, a lot, will occur more often than, greater than. Hypothesis need to be specific and objective. Debrief the activity. Discuss that on the GED® Science module, students may encounter questions that require them to set up an experimental design, including the development of a hypothesis statement.

Sample Debriefing Questions

Have students answer the following questions regarding writing an effective hypothesis:

- What is the difference between a general and a measurable hypothesis?
- Which of the three types of hypotheses described do you think a scientist is likely to use in his/her research?
- Why is it important to state a direction of the difference or relationship when writing a specific hypothesis?
- Why is it inappropriate to begin a hypothesis with the words "I think"?
- Look at each of the sample hypothesis. Which is most specific and measurable? Why?

Assessments/Extensions

Have students write a scientific hypothesis based on information obtained through a scenario. The following are sample scenarios that can be used to get started.

1. Geraldo believes that groceries at Costco will be less expensive than groceries at Safeway. Write a measurable hypothesis related to Geraldo's observation.
2. Amanda is having trouble focusing on homework. She sits at her desk and stares at her books, but her mind wanders and she can't focus on her work. Amanda wonders if she would focus better if she turns off all of the distractions around her. She gets her homework together and turns off the television and all other things that make noise in her room. Amanda predicts that eliminating "background noise" will help her focus.
3. Dillon wondered if eliminating all carbohydrates from his diet would help him lose weight. He weighed himself on Monday and then ate no food high in carbs for 7 days. He weighed himself the following Monday expecting that his weight would be the same as the previous week.
4. Scientists from the Department of Fish and Game have noticed that trout are more likely to get parasites when they are living in shallower, warmer, and muddy waters.
5. In my garden, I noticed that the shade-loving plants were not flourishing this year. In the past this has never been a problem.
6. A turtle kept at one of the New Zoo's exhibits is fed a green diet, which is consistent with her herbivorous food preference. In the past few months, however, this turtle refuses to eat any sort of vegetable.