

What Is a Scientific Hypothesis?

By Alina Bradford, Live Science Contributor | July 26, 2017 09:03am ET

A scientific hypothesis is the initial building block in the scientific method. Many describe it as an "educated guess," based on prior knowledge and observation. While this is true, the definition can be expanded. A hypothesis also includes an explanation of why the guess may be correct, according to National Science Teachers Association.

Hypothesis basics

A hypothesis is a suggested solution for an unexplained occurrence that does not fit into current accepted scientific theory. The basic idea of a hypothesis is that there is no pre-determined outcome. For a hypothesis to be termed a scientific hypothesis, it has to be something that can be supported or refuted through carefully crafted experimentation or observation. This is called falsifiability and testability, an idea that was advanced in the mid-20th century a British philosopher named Karl Popper, according to the Encyclopedia Britannica.

A key function in this step in the scientific method is deriving predictions from the hypotheses about the results of future experiments, and then performing those experiments to see whether they support the predictions.

A hypothesis is usually written in the form of an if/then statement, according to the University of California. This statement gives a possibility (if) and explains what may happen because of the possibility (then). The statement could also include "may."

Here are some examples of hypothesis statements:

- If garlic repels fleas, then a dog that is given garlic every day will not get fleas.
- Bacterial growth may be affected by moisture levels in the air.
- If sugar causes cavities, then people who eat a lot of candy may be more prone to cavities.
- If UV light can damage the eyes, then maybe UV light is a cause of blindness.

Testing a hypothesis

Notice that all of the statements, above, are testable. The primary trait of a hypothesis is that something can be tested and that those tests can be replicated, according to Midwestern State University.

In this box, please jot down notes. This includes: important facts, questions, thoughts, connections, etc. that you make while reading.

An example of untestable statement is, "All people fall in love at least once." The definition of love is subjective. Also, it would be impossible to poll every human about their love life. An untestable statement can be reworded to make it testable, though. For example, the previous statement could be changed to, "If love is an important emotion, some may believe that everyone should fall in love at least once." With this statement, the researcher can poll a group of people to see how many believe people should fall in love at least once.

A hypothesis is often examined by multiple scientists to ensure the integrity and veracity of the experiment. This process can take years, and in many cases hypotheses do not go any further in the scientific method as it is difficult to gather sufficient supporting evidence.

"As a field biologist my favorite part of the scientific method is being in the field collecting the data," Jaime Tanner, a professor of biology at Marlboro College, told Live Science. "But what really makes that fun is knowing that you are trying to answer an interesting question, so the first step in identifying questions and generating possible answers (hypotheses) is also very important and is a creative process. Then once you collect the data you analyze it to see if your hypothesis is supported or not."

Upon analysis of the results, a hypothesis can be rejected or modified, but it can never be proven to be correct 100 percent of the time. For example, relativity has been tested many times, so it is generally accepted as true, but there could be an instance, which has not been encountered, where it is not true. For example, a scientist can form a hypothesis that a certain type of tomato is red. During research, the scientist then finds that each tomato of this type is red. Though his findings confirm his hypothesis, there may be a tomato of that type somewhere in the world that isn't red. Thus, his hypothesis is true, but it may not be true 100 percent of the time.

The evolution of a hypothesis

Most formal hypotheses consist of concepts that can be connected and their relationships tested. A group of hypotheses comes together to form a conceptual framework. As sufficient data and evidence are gathered to support a hypothesis, it becomes a working hypothesis, which is a milestone on the way to becoming a theory. Though hypotheses and theories are often confused, theories are the result of a tested hypothesis. While hypotheses are ideas, theories explain the findings of the testing of those ideas.

"Theories are the ways that we make sense of what we observe in the natural world. Theories are structures of ideas that explain and interpret facts," said Tanner.