

Scientific Method

by Sophia



WHAT'S COVERED

In this lesson, you will learn how to identify the steps of the scientific method in a given scenario. Specifically, this lesson will cover:



BEFORE YOU START

Augmented Reality in Human Biology

Augmented reality, or AR, is a technology that blends physical and digital worlds. AR enhances your real-world environment by overlaying digital objects or information on top of it using a mobile device. You will have the opportunity to use AR to supplement some of the figures and charts in this course. Using the AR resources is *not required*, but may enhance your learning experience. To use AR, you will need a phone or tablet with a camera and browser. Then look for QR codes like this one throughout the course. Give AR a try and learn a few tips and tricks by scanning the code.

If you're on a laptop or desktop computer: Scan the QR code using the camera on your smartphone or tablet.

If you are on a phone or tablet [click here](#).



1. Scientific Method and Its Steps

The **scientific method** is a set of guidelines that scientists can use in order to help explain a phenomenon. Since it is used as a guideline, the scientific method isn't a rigid set of steps that needs to be followed.

The steps of the scientific methods are:

1. Observe
2. Ask a question
3. Develop a hypothesis
4. Make a prediction

5. Test the prediction
6. Repeat/Make new tests
7. Analyze and report

Let's discuss these seven steps to the scientific method in more detail, and then give you a concrete example of how they could be used in the real world.

Steps of the Scientific Method	
1. Make an Observation	An observation can be something that you see, hear, or experience. An observation involves using your senses to take in information about your surroundings.
2. Ask a Question	You're asking a question about what you have observed.
3. Develop a Hypothesis	A hypothesis is a proposed explanation about what you think is happening. A hypothesis should always be testable. You also want to make sure that your hypothesis is explaining what you think is happening.
4. Make a Prediction	A prediction is the first step to testing your hypothesis. You're basically asking yourself what you think you will observe.
5. Test Your Prediction	You test your prediction with an experiment . An experiment is a test that's done under controlled conditions in which you can manipulate things in order to try to explain the phenomenon that's happening. You'll set up an experiment, and then you'll collect data. In an experiment, you will always have variables , which are factors that can change.
6. Repeat Your Test or Make New Tests	If your results are in line with your hypothesis, you will repeat your test. You want to make sure that you repeat it several times because the more you repeat it and the more data that you have, the more accurate your results will be. Repeating the test will also help ensure that the results you get are not just a fluke; the more data, the better. Maybe the results that you get are different from what you were expecting. You can either repeat the test to make sure or make new tests using a different variable to try and figure out what's going on in order to explain that phenomenon that's happening.
7. Analyze and Report	Finally, you're going to analyze your results, and then report those results. Generally, scientists will report their results in a scientific journal.

IN CONTEXT

Suppose a soda company has consumers who report nausea after drinking their soda. Let's apply the steps of the scientific method.

1. Observation: An observation, in this case, could simply be: "Soda-drinkers report feeling nauseous after drinking a particular brand of soda."

2. Ask a Question: Is it actually the soda that's causing the problem? Or could it be something else? Is it possible that some people feel nauseous after drinking ANY kind of soda, rather than just one particular brand?

3. Develop a Hypothesis: Your hypothesis might be that one particular brand of soda correlates with more nausea than other brands.

4. Make a Prediction: Your prediction could be that many more people experience nausea after drinking a particular brand of soda than all the other brands.

5. Test Your Prediction: If you were to set up an experiment for the soda company example, the experiment might be to hire a large number of people, and each person will drink a particular brand of soda and report their reaction. The larger the number of people, the more accurate your test. If you only hire two people, and one has the flu, you will conclude by mistake that your soda causes nausea in half of its consumers. But if you hire 100 people and one has the flu, this will not significantly affect your conclusion.

Let's say for this example you're hiring 200 people, and half of them are given one can of soda a day for six weeks. The other half of them are given a different brand of soda, so they'll be our control group. All participants in this experiment, you'll say, are required to record their results each day.

If they get any sort of digestive upsets, they need to make a record of that. In an experiment, you will always have variables. In this case, the variable in this experiment is going to be the type of soda that you're using.

You have a control group using a different brand of soda, and then you have another group that's using the brand of soda that people are claiming makes them sick.

You're able to compare one group to the other to see if it's actually the soda causing the sickness or if it's possibly something else.

6. Repeat Your Test or Make New Tests: Suppose that you see the same rate of nausea (1 out of 100 soda-drinkers) for your particular brand of soda and another brand. This does not agree with your hypothesis ("one particular brand of soda correlates with more nausea than other brands"). Maybe your hypothesis was wrong, or maybe the control soda you used was another nauseating soda.

You must test your particular soda against other brands of soda to have enough data to accept or reject your hypothesis.

7. Analyze and Report: Analyze the results of the study and report back to the soda company.



TERMS TO KNOW

Scientific Method

A series of steps scientists can use as a guideline to solve a problem or examine a phenomenon.

Hypothesis

An educated guess or explanation of a phenomenon.

Experiment

A test set up to explain a phenomenon.

Variable

A factor in an experiment that can be changed or manipulated.

2. How the Scientific Method is Used

A **scientific theory** is an explanation of events based on repeated tests.

Scientific theories often will use the scientific method to explain a phenomenon, but they will have to do this several times, and under several conditions. They're repeating their tests over and over and getting the same results every time. Therefore, you know that when you call something a scientific theory, you believe it to be true since it's been tested so many times.

➞ **EXAMPLE** An example of a scientific theory would be the theory of natural selection. Darwin came up with this theory after he tested his research over and over and over again, on many different organisms, so many times that he could actually believe it to be true.



TERM TO KNOW

Scientific Theory

An explanation of an observation that has been rigorously tested.



MAKE THE CONNECTION

If you are taking the Human Biology Lab course simultaneously with this lecture, it's a good time to review the first Unit of that course. Not taking the course and want to know more? See the Human Biology Lab course in [Sophia's Science Course List](#).



SUMMARY

You learned that the scientific method is a set of guidelines that scientists use to help explain a phenomenon or event. This set of guidelines **includes steps** to follow when using the scientific method, such as developing a hypothesis and making a prediction. You also learned **how the scientific method is used in real life**. As an example, we discussed testing a brand of soda to determine how or if it caused stomach upsets.

Keep up the learning and have a great day!

Source: THIS WORK IS ADAPTED FROM SOPHIA AUTHOR AMANDA SODERLIND



TERMS TO KNOW

Experiment

A test set up to explain a phenomenon.

Hypothesis

An educated guess or explanation of a phenomenon.

Scientific Method

A series of steps scientists can use as a guideline to solve a problem or examine a phenomenon.

Scientific Theory

An explanation of an observation that has been rigorously tested.

Variable

A factor in an experiment that can be changed or manipulated.