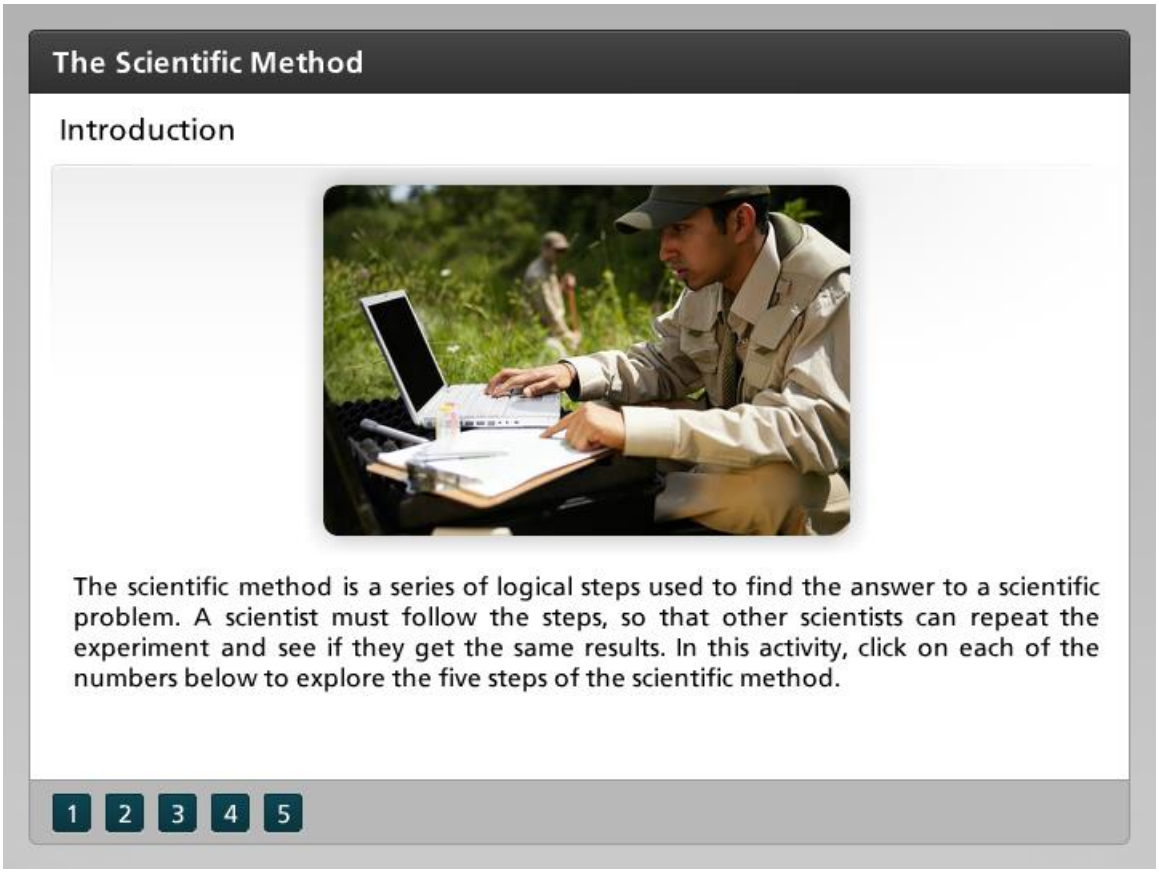
Module 1: What is Earth Science?
Topic 2 Content: The Scientific Method Notes

Introduction



The scientific method is a series of logical steps used to find the answer to a scientific problem. A scientist must follow the steps, so that other scientists can repeat the experiment and see if they get the same results. In this activity, click on each of the numbers below to explore the five steps of the scientific method.

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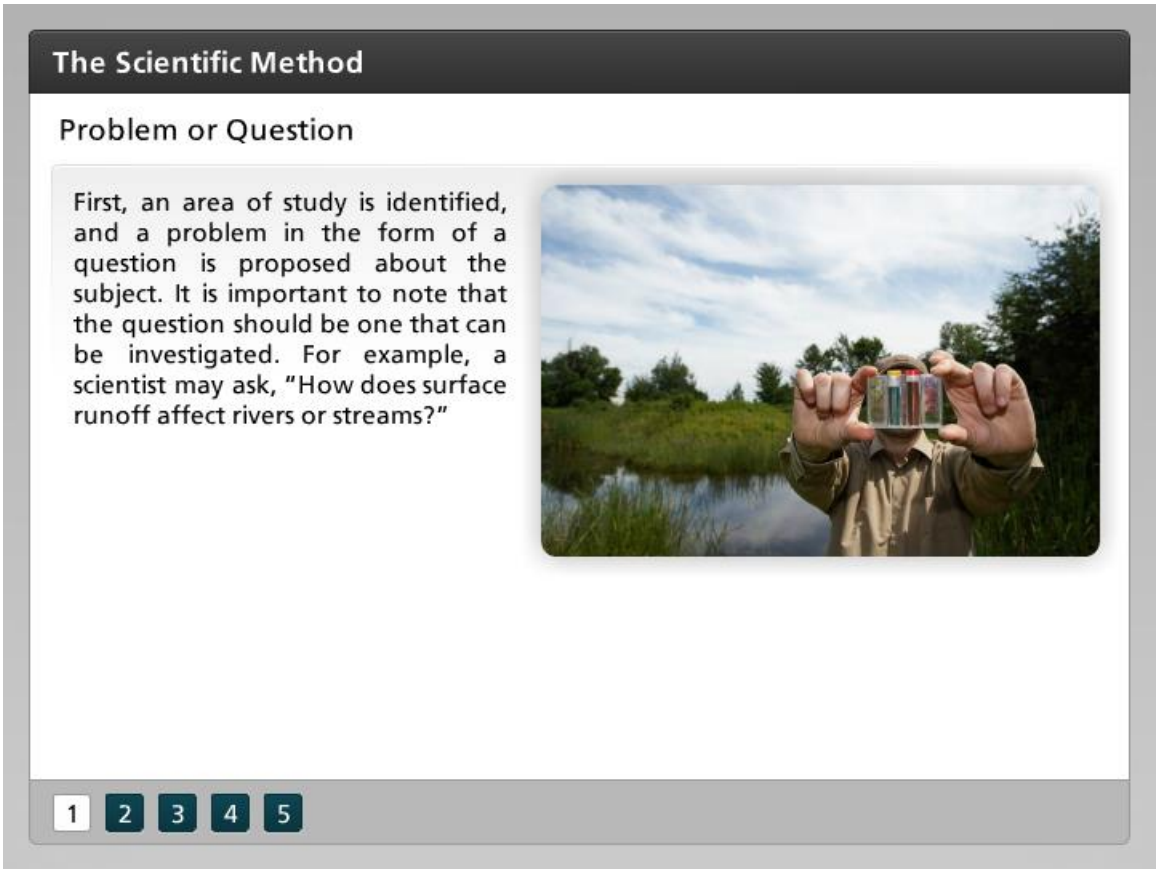
Problem or Question



First, an area of study is identified, and a problem in the form of a question is proposed about the subject. It is important to note that the question should be one that can be investigated. For example, a scientist may ask, "How does surface runoff affect rivers or streams?"

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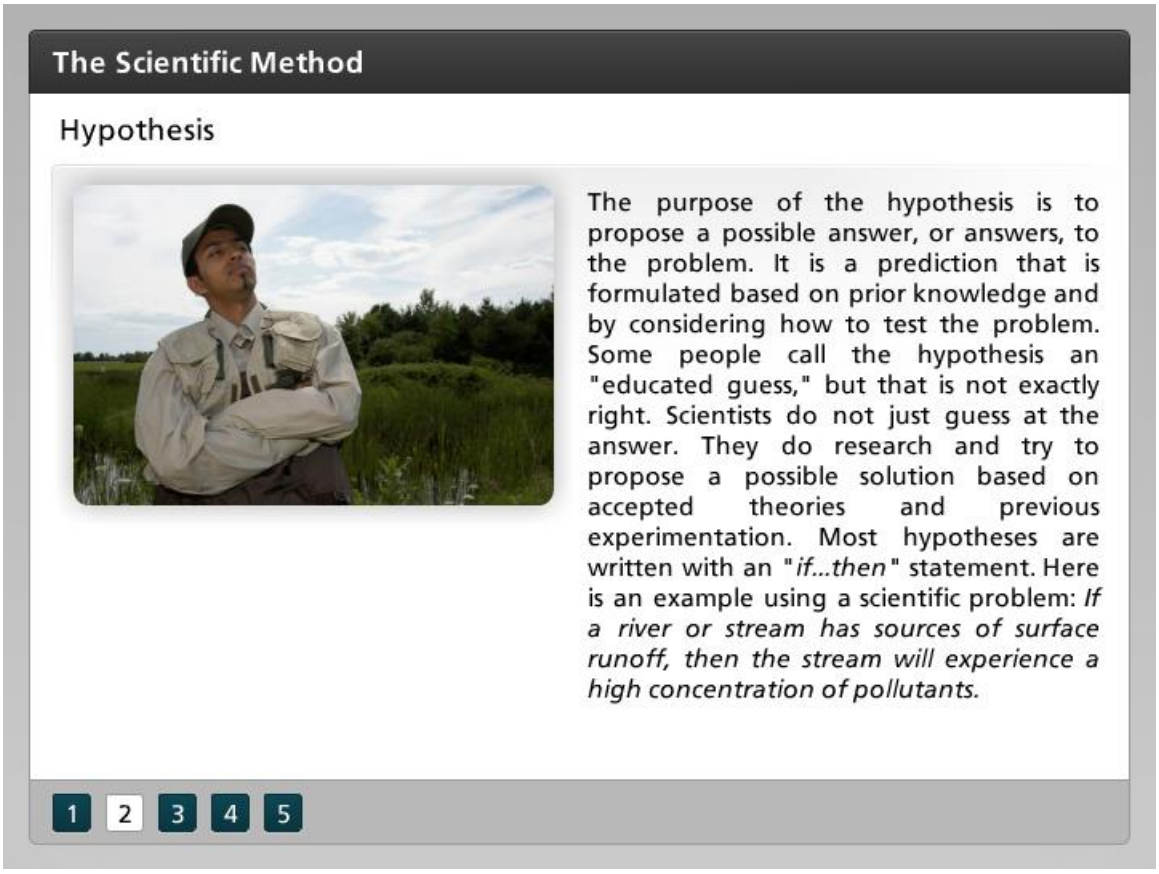
Hypothesis



The purpose of the hypothesis is to propose a possible answer, or answers, to the problem. It is a prediction that is formulated based on prior knowledge and by considering how to test the problem. Some people call the hypothesis an "educated guess," but that is not exactly right. Scientists do not just guess at the answer. They do research and try to propose a possible solution based on accepted theories and previous experimentation. Most hypotheses are written with an "*if...then*" statement. Here is an example using a scientific problem: *If a river or stream has sources of surface runoff, then the stream will experience a high concentration of pollutants.*

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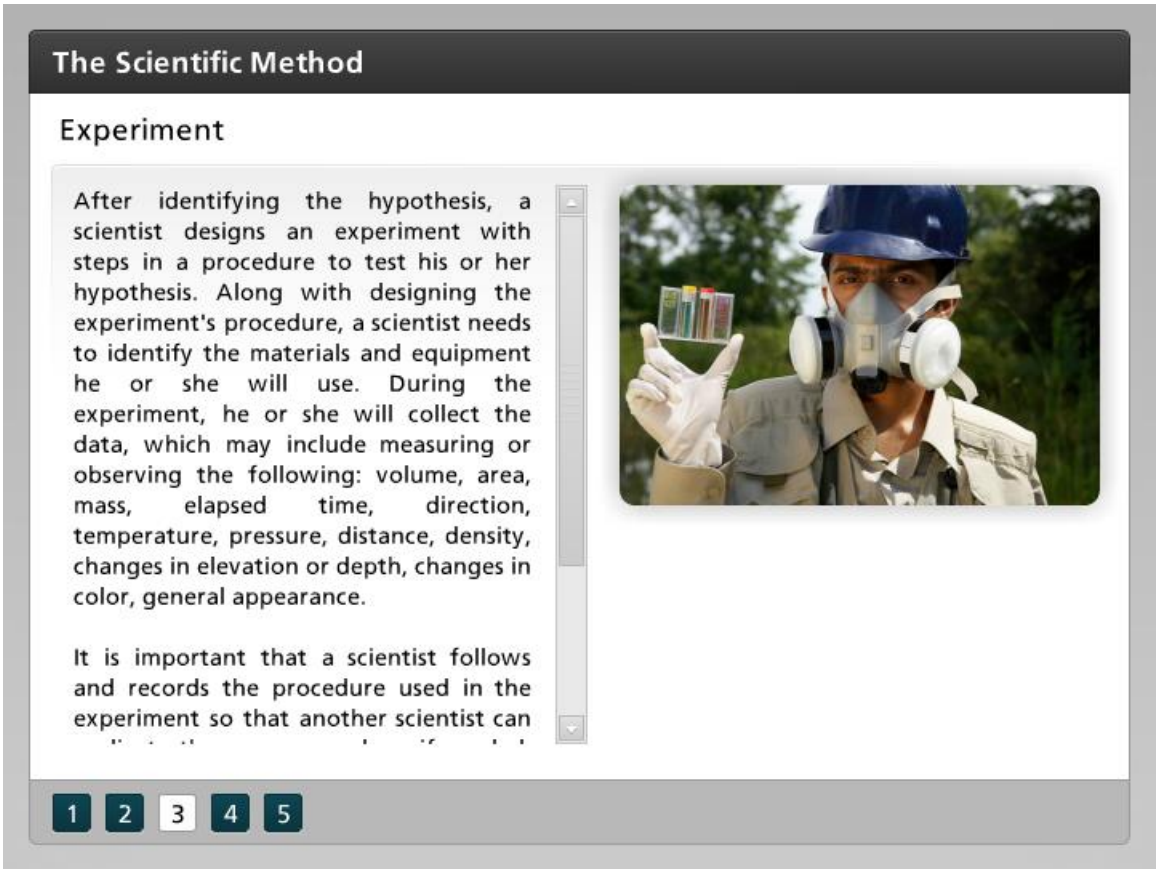
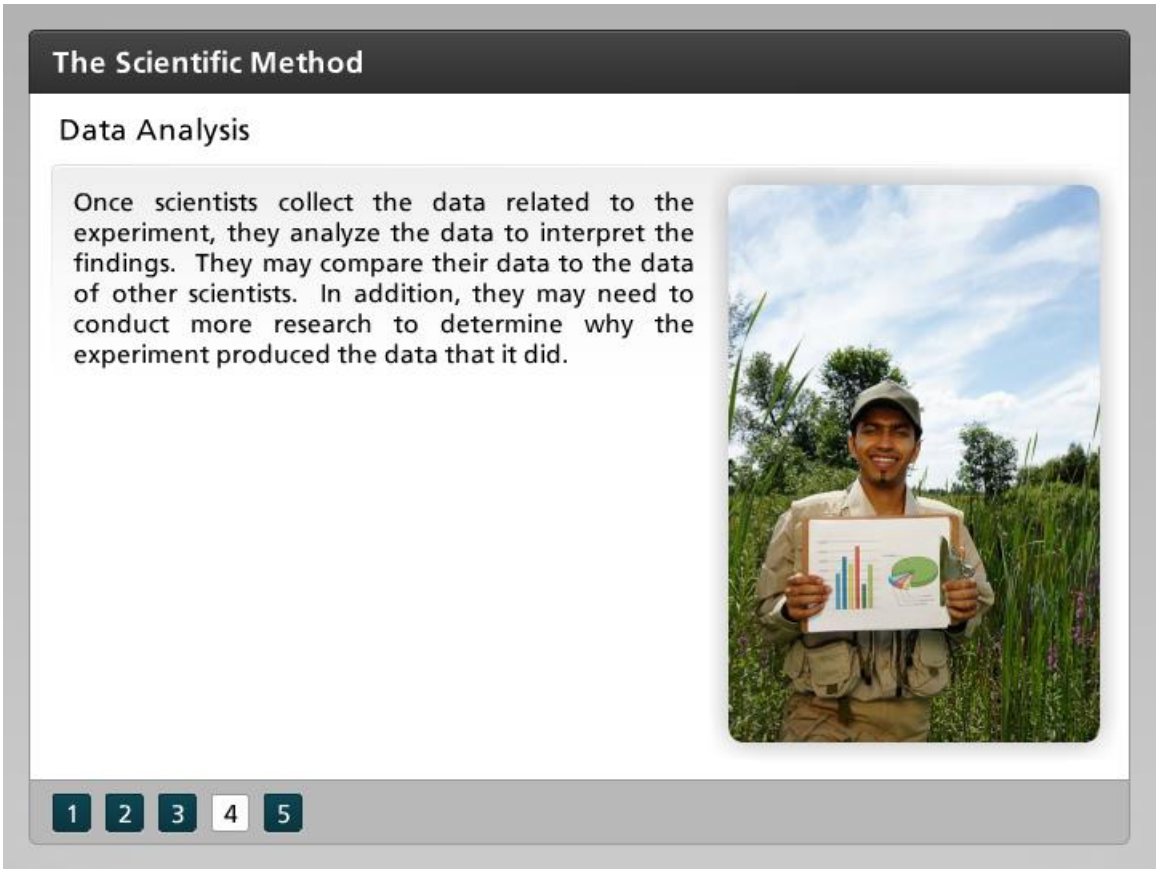
Experiment



After identifying the hypothesis, a scientist designs an experiment with steps in a procedure to test his or her hypothesis. Along with designing the experiment's procedure, a scientist needs to identify the materials and equipment he or she will use. During the experiment, he or she will collect the data, which may include measuring or observing the following: volume, area, mass, elapsed time, direction, temperature, pressure, distance, density, changes in elevation or depth, changes in color, general appearance.

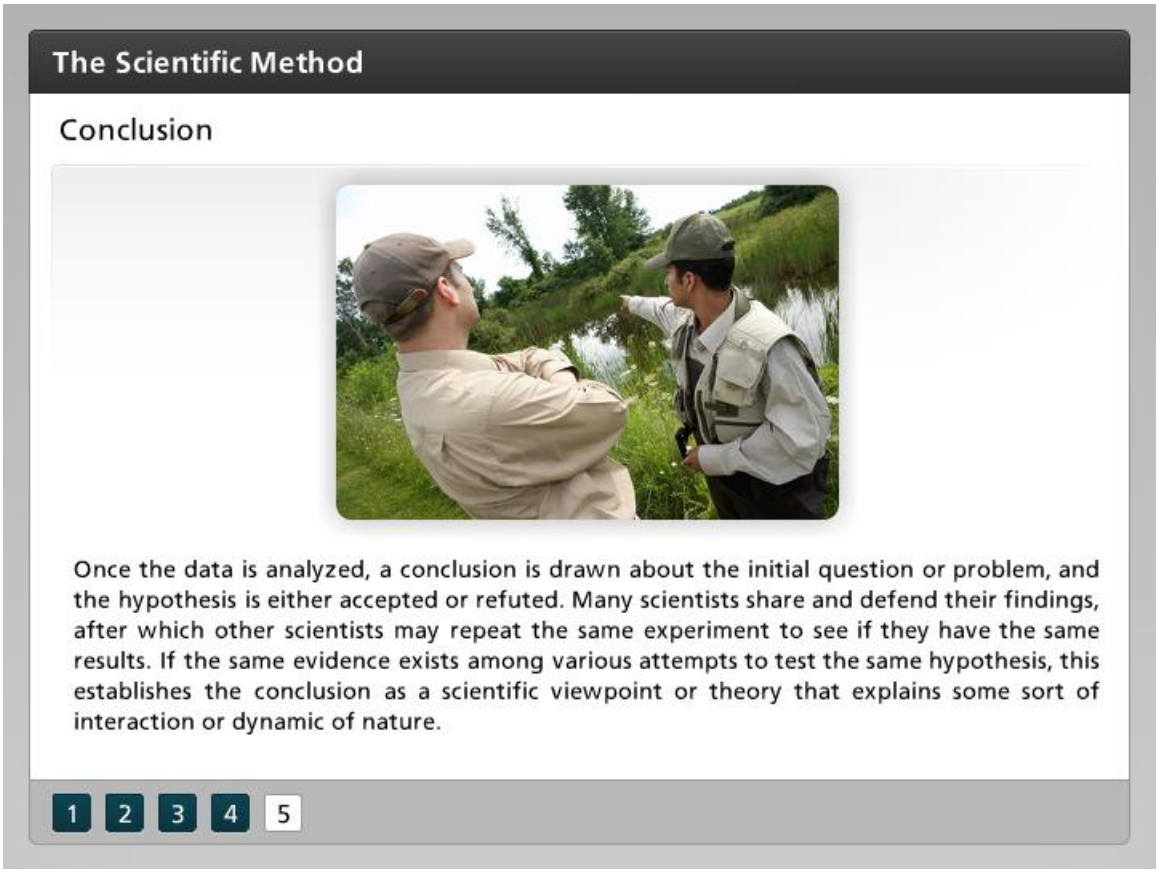
It is important that a scientist follows and records the procedure used in the experiment so that another scientist can replicate the same procedure, if needed. Scientists use a variety of tools to collect data, including computers, probes, global positioning systems, telescopes, and microscopes, just to name a few. They organize the data collected, which may include placing the data in diagrams, charts, graphs, or tables.

Data Analysis



Once scientists collect the data related to the experiment, they analyze the data to interpret the findings. They may compare their data to the data of other scientists. In addition, they may need to conduct more research to determine why the experiment produced the data that it did.

Conclusion



Once the data is analyzed, a conclusion is drawn about the initial question or problem, and the hypothesis is either accepted or refuted. Many scientists share and defend their findings, after which other scientists may repeat the same experiment to see if they have the same results. If the same evidence exists among various attempts to test the same hypothesis, this establishes the conclusion as a scientific viewpoint or theory that explains some sort of interaction or dynamic of nature.