Getting It Right

What are some ways to confirm that an investigation is valid?

Scientific investigations should be carried out with great care. But scientists are only human. Sometimes they fail to plan properly. They may make mistakes in collecting or analyzing data because they are in a hurry. On rare occasions, irresponsible scientists produce false results on purpose. Fortunately, there are procedures that help expose flawed investigations.

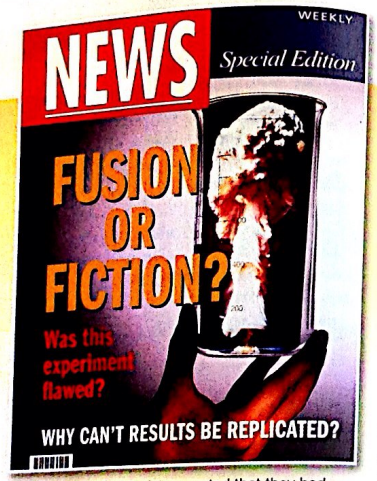
Evaluating Investigations

Peer Review

Before a study is published, it is read by scientists who were not involved in the investigation. These peer reviewers evaluate the methods used in a study and the conclusions reached by its authors. For example, a reviewer could decide that an experiment was not properly controlled. Or a reviewer might say that the sample used in a survey was too small to be meaningful. Even after a study is published, scientists must answer questions raised by other scientists.

Replication

An important way to confirm an investigation is for other scientists to replicate it, or repeat the investigation and obtain the same findings. To make this possible, scientists must disclose the methods and materials used in the original study when they publish their findings. Not every investigation needs to be replicated exactly. But if a study cannot be supported by the results of similar investigations, it will not be accepted by the scientific community.



In 1989 a pair of scientists reported that they had accomplished cold nuclear fusion. The possibility of a cheap source of energy excited the public. However, other scientists considered the claim impossible. Attempts to replicate the findings failed.

Think Outside the Book

14 Evaluate Research the cold fusion news reported in 1989. Write a few paragraphs about the study. Did the study exhibit the characteristics of a good scientific investigation? Explain.

How can you evaluate the quality of scientific information?

Scientific information can be found on the Internet, in magazines, and in newspapers. It can be difficult to decide which information should be trusted. The most reliable scientific information is published in scientific journals.

The most reliable information on the Internet is on government or academic webpages. Other sites should be examined closely for errors, especially if they are selling things.

Although the lab reports that you prepare for school might not be published, you should try to meet the same standards of published studies. For example, you should provide enough information so that other students can replicate your results.

Visualize It!

15 Apply List two examples of poor scientific methodology found in this student's lab report.

Problem: How does the amount of sunlight affect the growth of plants?

Hypothesis: Plants that spend more time in the sunlight will grow taller because plants grow taller in warm conditions.

Changed variables: amount of time in the sunlight and type of plant

Constant variables: amount of water

Materials: plants, water, sunlamp, ruler

Procedure: Take the plants and put them under the sunlamp. Leave some of them under the lamp for longer amounts of time than others.

Data Table:

Plant number	Length of time in sunlight per day	Height after 2 weeks
1	5 hours	8 inches
2	8 hours	12 inches

16 Assess Would you believe this result or would you be skeptical of it? Explain your answer.