

The Study of Life

section 1 The Nature of Science

MAIN Idea

Science is the process based on inquiry that seeks to develop explanations.

What You'll Learn

- characteristics of science
- how to distinguish science from pseudoscience
- the importance of the metric system and SI

Mark the Text

Restate the Main Point

Highlight the main point in each paragraph. Then restate each main point in your own words.

Reading Check

1. **Identify** the difference between a theory and a law.

Before You Read

When you see a headline such as *Alien Baby Found in Campsite*, how do you know whether to believe it? Write your thoughts on the lines below. Then read the section to learn how to tell the difference between science and pseudoscience.

Read to Learn

What is science?

Science is a body of knowledge based on the study of nature and its physical setting. The purpose of science is scientific inquiry—the development of explanations. Scientific inquiry is a creative process as well as a process involving observation and experimentation.

How are scientific theories developed?

A **theory** is an explanation of a natural phenomenon supported by many observations and experiments over time. A scientific explanation combines what is already known about something with many observations and experiments. An explanation becomes a theory only when investigations produce enough evidence to support the idea. On the other hand, a **law** describes the scientific relationships under certain conditions of nature.

A pseudoscience (soo doh SI uhnts) is an area of study that tries to imitate science. Astrology, horoscopes, and psychic reading are pseudosciences. They are not supported by science-based evidence.

How does science expand knowledge?

Science is guided by research that results in a constant reevaluation of what is known. This reevaluation process leads to new knowledge. It also leads to new questions that require more research.

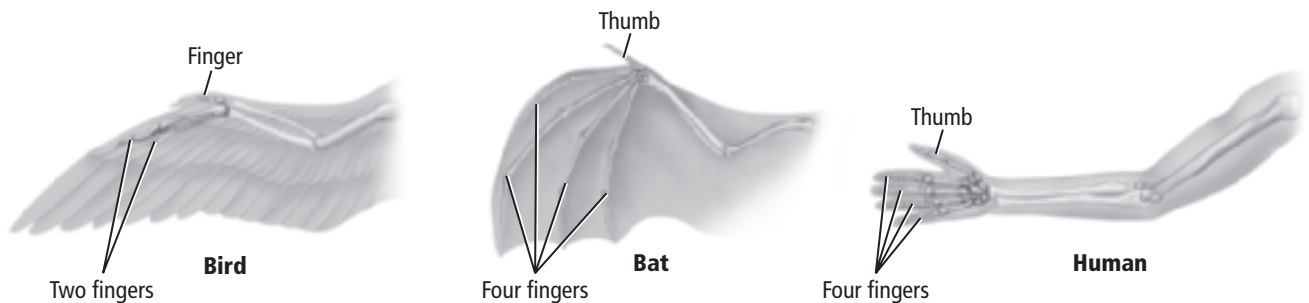
What happens when scientists disagree?

Scientists welcome debate. Disagreements among scientists often lead to further investigation. Science advances when new discoveries are added to the existing body of knowledge. For example, scientific research has dramatically increased our understanding of metabolic syndrome in athletes.

How do scientists deal with inconsistent data?

When observations or data are not consistent with current understanding, scientists investigate the inconsistencies. For example, some early biologists suggested that bats had traits that were more similar to those of mammals than those of birds, as shown in the figure below. This idea led to further investigation. The new evidence confirmed that bats are more closely related to mammals than to birds.

In pseudoscience, observations that are not consistent with beliefs are ignored.



How do scientists test claims?

In science, all research follows standard procedures. Conclusions are based on evidence from carefully controlled investigations. Pseudoscientists make claims that cannot be tested. These claims are a mix of facts and opinions.

How are scientific investigations evaluated?

Scientific investigations undergo peer review. **Peer review** in science is a process in which the procedures used during an experiment and the results are evaluated by scientists who are in the same field or are doing similar research.

Reading Check

2. Contrast the role of research in science and pseudoscience.

Picture This

3. Compare Are the structures of a bat's wing more like a human arm or a bird's wing? Explain.

How do scientists conduct research?

Scientists have several ways to research a topic. They could do experiments, run surveys, analyze work that has already been done, or do a case study. A case study is an intensive study of a group, an incident, or a community. For example, one scientist conducted a case study on college football players and their exercise routines and nutrition habits. The results of the case study showed that athletes may have risk factors associated with heart disease and diabetes.

Science in Everyday Life

Science is not limited to the laboratory. It is all around you. Many popular television shows about crime are based on **forensics**—the field that uses science to investigate crime. The media is filled with information on medical advances, new scientific discoveries, and new technologies.

Why is science literacy important?

To evaluate the vast amount of information available in print, online, and on television, you must be science literate. To be science literate, you need to combine a basic understanding of science and its process with reasoning and thinking skills.

Many important issues today relate to biology. Drugs, alcohol, tobacco, AIDS, mental illness, cancer, heart disease, and eating disorders are all subjects for biological research. You and future generations will face environmental issues, such as global warming, pollution, use of fossil fuels, nuclear power, genetically modified foods, and preserving biodiversity.

How do ethics apply to science?

Many scientific inquiries involve ethics. **Ethics** are a set of moral principles or values. Ethical issues are involved in the study of cloning, genetic engineering, euthanasia (yoo thuh NAY zhuh), and cryonics (kri AH niks). Euthanasia is permitting death for reasons of mercy. Cryonics is freezing a dead organism with the hope of reviving it in the future.

Scientists provide information about new discoveries and technology. As a scientifically literate adult, you will be able to participate in discussions about important issues. You will have the opportunity to support policies that reflect your values.



Think it Over

- 4. Apply** How has science changed our views about tobacco?



Think it Over

- 5. Summarize** Complete the following sentence:
I need to be science literate in order to ...
