

Lesson 2

The Nature of Science

Focus Question

What are the characteristics of scientific inquiry?

New Vocabulary

science

hypothesis

theory

law

inference

peer review

ethics

Review Vocabulary

investigation: a careful search or examination to uncover facts

What is science?

- **Science** is the use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process.
- The nature, or essential characteristic, of science is scientific inquiry.
- Scientific inquiry is both a creative process and a process rooted in unbiased observations and experimentation.

What is science?

- A testable explanation of a situation or phenomenon is called a **hypothesis**.
- A **theory** is an explanation of a natural phenomenon supported by many observations and experiments over time.
- A scientific **law** describes relationships under certain conditions in nature, but it does not explain why the relationship is the way it is.
- Theories do not become laws, and laws do not become theories.

What is science?

Makes observations and draws conclusions

- Scientists choose subjects to study and decide what types of data to collect.
- Tools are used to make measurements and collect data.
- Scientists analyze the data collected to draw conclusions.
- The process of combining what you know with what you have learned to draw logical conclusions is called inferring; the conclusions themselves are called **inferences**.

What is science?

Expands knowledge

- Scientific explanations combine what is already known with evidence from additional observations and experiments.
 - Driven by the search for new knowledge
 - Constantly reevaluates what is known
- Pseudosciences imitate science.
 - Driven by cultural or commercial goals
 - New questions and additional research are not welcomed

What is science?

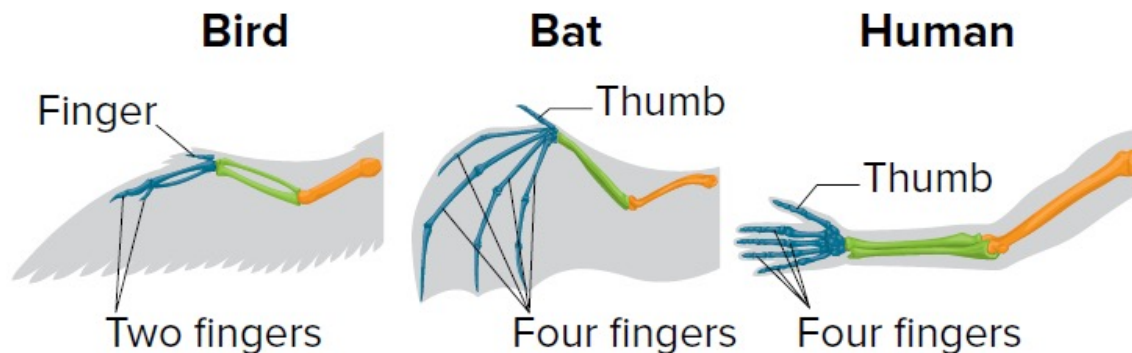
Challenges accepted theories

- Scientists welcome debate about one another's ideas.
- Sciences advance by accommodating new information as it is discovered.

What is science?

Questions results

- In science, data that are not consistent with current scientific understanding are of interest and lead to new investigations.
- For example, understandings about relationships between organisms change as new information becomes available.
- In pseudoscience, inconsistencies are ignored.



What is science?

Tests claims

- Scientists use standard experimental procedures.
- Their claims are based on a large amount of data and observations obtained from unbiased investigations and carefully controlled experimentation.
- Pseudoscientists make claims that cannot be tested or that are a mixture of fact and opinion.

What is science?

Undergoes peer review

- Before it is made public, science-based information is reviewed by scientists' peers.
- **Peer review** is a process by which the procedures used during an experiment and the experiment's results are evaluated by other scientists who are in the same field or who are conducting similar research.

Science in Everyday Life

- Science is not limited to the laboratory. Science fills our everyday lives.
- It has brought advances in medicine, transportation, communication, agriculture, and overall quality of life.

How can you be scientifically literate?

Science literacy

- A scientifically literate individual is an educated consumer who can participate in discussions about important issues.
- **Ethics** is a set of moral principles or values.

How can you be scientifically literate?

Develop critical thinking skills

- Scientists analyze, evaluate, and critique scientific explanations.
- Each scientific explanation must be closely examined, and the explanations are often debated.
- To make informed decisions about scientific topics, you must also be able to analyze, evaluate, and critique scientific explanations.

How can you be scientifically literate?

Examine the evidence

- Scientific evidence is gathered in a variety of ways:
 - Empirical evidence: verifying explanations by using experience or investigations
 - Logical reasoning: evaluating an explanation using reasoning
 - Experimental testing: gathering data based on controlled investigations
 - Observational testing: gathering data based on observations

How can you be scientifically literate?

Evaluating promotional materials

- Some promotional material makes scientific claims.
- The claims must be analyzed, evaluated, and critiqued.
- Consider the evidence on which the claims are based.