

Thinking like a Scientist

Key Concept Scientific progress is made by asking meaningful questions and conducting careful investigations.

What You Will Learn

- The habits of mind that scientists use include curiosity, skepticism, openness to new ideas, creativity, intellectual honesty, and ethical responsibility.
- Studying science can help you become a better-informed consumer.
- Most scientists follow a code of ethics so that no living thing is subjected to unnecessary harm.

Why It Matters

Thinking like a scientist can help you ask questions and solve problems in your everyday life.

Vocabulary

- skepticism
- scientific literacy

READING STRATEGY

Brainstorming The main idea of this section is that all scientists share certain qualities. Brainstorm words and phrases that describe scientists. Record your work in your **Science Journal**.

skepticism (SKEP ti siz uhm) a habit of mind in which a person questions the validity of accepted ideas

► You are preparing a gelatin dessert. You mix the gelatin with pineapple. You then put the mixture in the refrigerator to set overnight. In the morning, you find just a pan of liquid with pineapple in it! What happened?

To answer this riddle, you need to think like a scientist. Ask yourself the following questions: Did I mix the gelatin enough? Was the water too hot or too cold? Or did the pineapple ruin my dessert? After some research, you find out that pineapple has an enzyme that prevents gelatin from setting!

Scientific Habits of Mind

Although scientists work in many fields, they share certain habits of mind. Scientists are curious, skeptical, openness to new ideas, creative, and ethical. And they learn from their mistakes. The inventor Thomas Edison once said that he never failed; he just found 10,000 ways that did not work.

Curiosity

Scientists are curious about the world around them. **Figure 1** shows a scientist named Jane Goodall. Goodall was very curious about where chimpanzees lived, what they ate, and how they interacted. Curiosity led Goodall to study chimpanzees for more than 30 years. Goodall's questions, research, and writings changed what scientists know about chimpanzees and other primates.

Figure 1 Jane Goodall has studied chimpanzees for more than 30 years. Her curiosity helped her make many discoveries about chimpanzees.



Skepticism

Skepticism is the practice of questioning accepted ideas or claims. Skepticism helps scientists question the assumptions that influence how we see the world. Skepticism helped one scientist discover a major threat to the environment. Rachel Carson, shown in **Figure 2**, was a biologist in the 1950s. At the time, scientists were developing many new kinds of pesticides to kill insects. The companies that made the chemicals said that the chemicals would not harm animals other than insects. Carson did not believe these claims. She questioned whether chemicals that killed insects would also harm other living things.

After much research, Carson wrote a book, *Silent Spring*. The book started debates about the use of pesticides in the United States. Some chemical companies threatened to sue Carson and tried to discredit her. But she stood by her findings, and her work led to controls on pesticide use. In particular, *Silent Spring* led to the banning of a chemical called *DDT*. DDT had threatened bald eagle populations in the United States. By being skeptical and asking questions, Carson encouraged others to think about the world around them.

Openness to New Ideas

Keeping an open mind means considering new ideas. However, this process may be harder than it sounds. Often, people make assumptions about the world based on what they are used to. Scientists in particular should be open to new ideas, even if these ideas differ from their own beliefs. Sometimes, considering an opposing idea can lead to a breakthrough that is the basis of a new discovery.



Figure 2 Rachel Carson was skeptical of the claims made by pesticide manufacturers. Her research helped bald eagles recover from the effects of pesticides in the environment.

Quick Lab

Using Curiosity to Make Predictions

How many drops of water do you think you can fit on the head of a penny? Being curious helps you ask questions and motivates you to find answers.

► Try It!

1. Predict the number of drops of water that you can place on the head of a penny. Record your prediction.
2. Place a **penny** head side up flat on a **table**.
3. Fill an **eyedropper** with **water**.



4. Count the number of drops of water that you can place on the penny. Stop counting when the water runs down the side of the penny.

► Think About It!

5. How many drops of water were you able to place on the penny? Was your prediction correct? Explain your answer.



6.7.a
6.7.e



10 min

SECTION Review

Summary

- Scientists are curious, creative, skeptical, and open to new ideas.
- It is important for scientists to be honest and ethical in their treatment of humans and other living things.
- People from diverse backgrounds have made many contributions to the advancement of science.
- Increasing scientific literacy and developing critical-thinking skills are goals of science education.
- Scientists always evaluate the credibility of information that they receive.
- Scientists can have public roles in society. In addition to explaining scientific concepts to the media, scientists work to improve the quality of people's lives.
- There are many opportunities to participate in science programs in your community.

Using Vocabulary

- 1 Write an original definition for *skepticism* and *scientific literacy*.

Understanding Concepts

- 2 **Listing** Identify six scientific habits of mind.
- 3 **Justifying** Defend the idea that curiosity, skepticism, and openness to new ideas are important in science.
- 4 **Demonstrating** Why is it important for scientists to follow a code of ethics when conducting research?
- 5 **Describing** Who can be a scientist?
- 6 **Describing** Describe the meaning of informed consent.
- 7 **Applying** Why is it important to become scientifically literate?

Critical Thinking

- 8 **Applying Concepts** Describe a volunteer science opportunity that interests you.
- 9 **Evaluating Sources** Explain why scientists must always evaluate sources of information. Why is it important to be particularly skeptical of information found on the Internet?

INTERPRETING GRAPHICS Use the image below to answer the next two questions.



- 10 **Evaluating Data** Which of the statements on the label might make a scientist skeptical?
- 11 **Analyzing Methods** How might a scientist determine whether the statements on the label are true?

Challenge

- 12 **Predicting Consequences** Scientists on a research team have developed a new drug that they claim can cure cancer. They want to sell the drug, but they have not followed the peer-review process. What are some possible negative consequences of putting the drug on the market? Develop a peer-review process that could be used in researching the drug and that would prevent the negative consequences that you identified.

Internet Resources

For a variety of links related to this chapter, go to www.scilinks.org

Topic: **Scientists in California**

SciLinks code: **HY7C11**