



ACTIVITY 8

Science Is a Human Endeavor

VIDEO

8: SCIENCE IS A HUMAN ENDEAVOR

GUIDING QUESTION

What role does scientific optimism play in the development of scientific solutions?

INTRODUCTION

The proportion of the global population using safely managed drinking water services increased from 61% to 71% from 2000 to 2017. Yet global water demand is projected to continue to increase—by 55% between 2000 and 2050. In some regions, high levels of water withdrawals have reduced the water quality of the remaining water. In other areas, water sources have become polluted. The availability of water and its quality are linked. How can communities address the growing need for clean available water? **Scientific optimism**—the belief that persistence and iteration on a scientific problem will eventually lead to insights—helps scientists (as well as others) persevere long enough to contribute solutions to difficult problems such as access to clean water. Figure 8.1 describes how one scientist relied on scientific optimism to address an environmental problem. In this activity, you will watch videos showing how an attitude of scientific optimism is leading people to develop new tools and technologies to address growing water needs.

FIGURE 8.1

In 2013, Japanese-Peruvian scientist Marino Morikawa cleaned the algal blooms and bacterial contamination of El Cascajo Lake, Peru, in one year. He invented a nanobubbling system made up of bubbles 10,000 times smaller than those in a soft drink. He used his system to trap polluting microbes into ceramic biofilters that he built after taking a pottery class.



El Cascajo Lake, Peru
BEFORE



El Cascajo Lake, Peru
AFTER

CONCEPTUAL
TOOLS



PROCEDURE

- 1 Preview the sections on Student Sheet 8.1, “Video Notes.”
- 2 As you watch each video, write notes in the appropriate section of Student Sheet 8.1. Your teacher will pause the video after individual segments.
- 3 Complete Student Sheet 8.1 by describing how each person and/or team exhibited scientific optimism.
- 4 In each video, you saw recent innovations for addressing water availability. Work with your group to brainstorm two ideas for improving the availability of safe drinking water where you live as well as in other parts of the world.
- 5 Share your ideas with the class. As a class, make a list of ideas for improving the availability of safe drinking water. Record this list in your science notebook.
- 6 As a class, discuss how the work of the people highlighted in the videos connects to scientific optimism and scientific advancement.



A fog collector being used in Peru. As fog passes through the mesh, drops of freshwater form and drip into a gutter, which directs water into a storage container.

MATERIALS LIST

FOR EACH STUDENT
— STUDENT SHEET 8.1
“Video Notes”

BUILD UNDERSTANDING

- ① The development of scientific knowledge occurs through continual reevaluation and iteration of ideas that are informed by:
 - new evidence
 - improved methods of data collection and experimentation
 - collaboration with others
 - trial and error

Which methods did the individuals featured in the videos use? Explain how each person used one or more of these methods.

- ② Look back at the work you have done so far in this unit.
 - a What other examples of scientific optimism have you encountered? List as many as you can.
 - b Choose one example and explain exactly how it represents scientific optimism.
- ③ What role does creativity play in scientific optimism? Support your answer with an example.
- ④ Imagine you are a scientist working on water issues in Skipton. What questions would you like to investigate? How could these questions help address water quality and water availability in Skipton? Describe the research you would do and how it might address Skipton's water problems.

CONNECTIONS TO EVERYDAY LIFE

- 5 How do you use optimism in your own life? Describe a situation in which you persist toward your own goals even when you encounter challenges.
- 6 Different food crops require different amounts of water, as shown in Table 8.1. What role do you think science can play in reducing the amount of water needed for agriculture?

TABLE 8.1
GLOBAL AVERAGE WATER FOOTPRINT (PER TON OF CROP)

FOOD CROP CATEGORIES	WATER USAGE (CUBIC METERS PER TON)
Sugar (sugar cane, sugar beet, etc.)	200
Vegetables	300
Roots and tubers (potatoes, yams, etc.)	400
Fruits	1000
Cereals (corn, wheat, rice, etc.)	1600
Oils (sunflower, canola, peanut, etc.)	2400
Pulses (lentils, peas, dried beans, etc.)	4000

EXTENSION 1

Addressing global water needs can sometimes be aided by advances in technology. In other cases, solutions can be found in traditional techniques. Watch a video provided by your teacher that highlights the use of a traditional technique for addressing water availability. In what ways do traditional techniques contribute to scientific advancement?

EXTENSION 2

How has scientific optimism driven recent innovations in science and technology? Do an online search to select one recent innovation that interests you. Identify the person(s) responsible for the breakthrough and what motivated them to do their work. Share your findings with a family member. Ask your family member to describe an innovation in science or technology that has happened in their lifetime and how it has changed the way they live. Work together to find out who was responsible for the innovation they describe and what the motivation was behind that person's work.

KEY SCIENTIFIC TERMS

scientific optimism