Name: _____ Date: _____

Eleven Years Old and Testing the Water

Reading level 8 (4th grade) · 776 words

Fill a glass at the tap. The water looks clear. Is there lead in it? Looking is not enough. The EPA says testing is the only sure way to know. In 2017, an eleven-year-old named Gitanjali Rao built a tool that tests water for lead. It won a big national prize of $25,000.

Lead is a metal. It can get into water from old plumbing. The EPA says it gets in when pipes, faucets, and fixtures that contain lead wear away. The EPA's health goal for lead in drinking water is zero. So people need good ways to check their water.

Rao had followed the water issue in Flint, Michigan, for about two years. She said, "I was appalled by the number of people affected by lead contamination in water." She wanted to help. The CDC says no safe level of lead in a child's blood has been found.

How do people test water for lead? One way is a test strip. A strip is fast. But one report said strips are not always accurate. Of testing at home, Rao said, "this is not a reliable process and I've got to do something to change this." She wanted a test that was easy to use at home.

Her chance came in a science contest. It is called the Young Scientist Challenge. Kids in grades 5 to 8 can enter. You make a video, one to two minutes long. It tells about a new tool or a fix for an everyday trouble.

In 2017, the videos were due by April 19. Out of all the entries, ten kids were picked. Rao was one of the ten. Each of them got a whole summer to build a working model of an idea and try it out.

Each of the ten also got a mentor. A mentor is an expert who guides you. For three months, they worked with scientists from a big company called 3M. Rao's mentor was Kathleen Shafer. She is a research specialist who works on new kinds of plastics.

The work did not go smoothly. Rao said, "I had so many failures when I was doing my tests." She did not see them as wasted. She said she knew they were learning experiences. They would make her experiment better.

Here is what she built. It is called Tethys. It has three parts. First, a cartridge that you use once and throw away. Second, a small reader with a Bluetooth link. Third, a phone program that shows the answer. One news report called the whole thing portable and fairly cheap.

Inside the cartridge are nanotubes. These are tubes made of carbon. They are far thinner than a hair, and one website says about a hundred-thousandth of its width. Many of them sit side by side in the cartridge. They have been treated with chemicals.

Electricity is a flow of tiny bits called electrons. The tubes are very sensitive to any change in

that flow. Now dip the cartridge in clean water. The flow does not change. The phone says the water is safe to drink.

One 2017 report explained the next part this way. Dip the cartridge in water with lead. The tubes are lined with atoms that pull on lead. The lead reacts with those atoms. That makes it harder for electrons to flow. This is called resistance. The reader measures it, and the phone says the water is not safe.

Picture a hallway. When it is empty, people walk fast. When it fills up, they slow down. The tubes work a little like that. When lead sticks to them, it is like a crowd in the hall: it slows the flow. The reader checks how much it slows. That is the clue the phone shows.

In October 2017, Rao was named the grand prize winner. She was eleven. One judge said, "It's not hyperbole to say she really blew us out of the water." She planned to put part of the prize into her tool, to make it ready to sell.

In December 2020, TIME magazine named her its first Kid of the Year. She was picked from more than 5,000 kids who were named for the honor. By then she had also set a goal of mentoring kids. She said she had hit it: 30,000 of them.

Years later, Rao named five steps she now uses on every project: observe, brainstorm, research, build, communicate. Looking back, Tethys fits three of them, in this book's reading. She followed a problem in Flint. She built a cartridge. She told her idea in a video. Her advice: "Don't feel pressured to come up with something big."

Questions

1. What does the EPA say is the only sure way to know if there is harmful lead in drinking water?

A. Looking at the color
B. Testing it
C. Boiling it

2. Who was Kathleen Shafer in Rao's story?

A. Her mentor from 3M
B. A judge who named the winner
C. A kid in the contest

3. Why might a test strip leave Rao wanting a better test?

A. Strips are not always accurate
B. Strips only work in Flint
C. Strips cost $25,000

4. In the sentence "Each of the ten also got a mentor," what is a mentor?

A. A kind of prize
B. A test strip
C. An expert who guides you

5. What does the phone say when the cartridge is dipped in water with lead?

A. The water is not safe
B. The water is safe to drink
C. The cartridge is full

Words to know

cartridge: throwaway part
resistance: slows the flow
mentor: expert guide
nanotubes: tiny carbon tubes
electrons: tiny charged bits

Answer key: Eleven Years Old and Testing the Water

1. B. Testing it
2. A. Her mentor from 3M
3. A. Strips are not always accurate
4. C. An expert who guides you
5. A. The water is not safe