

LESSON 5 / FAMILY GUIDE

Water for Everyone

Can you design a water system for a whole community?

ENGINEERING CHALLENGE: Design a community water system that serves different people and places - and adapt it when needs or conditions change.

At a Glance

Age	6-10 years
Estimated time	45-60+ minutes
Engineering field	Environmental, Civil & Systems Engineering
Engineering practices	Ask, Imagine, Create, Test, Improve
Big ideas	Systems, infrastructure, access, and design constraints

Materials

Gather these first

Paper or cardboard; markers, crayons, or pencils; recycled containers or small boxes; and string, tape, straws, foil, or other available materials.

- Optional: a little water with a tray, toy blocks or buildings, drawings of homes, schools, gardens, or clinics, and sticky notes showing different people's needs.
- Build, draw, explain, tell a story, or combine methods. These are all valid ways of participating in engineering design.

Caregiver Notes

Your role

This lesson asks not only, "Does the system work?" but also, "Who does it work for?" Encourage your child to consider different needs, routines, abilities, and distances.

Introduce new community members or an unexpected condition, but allow your child to decide how to respond. Listening, pointing, sketching, explaining, and building all count.

Start the Conversation

Why water engineers study this

A community needs water for drinking, cooking, cleaning, growing food, caring for animals, schools, businesses, and healthcare. Water systems connect sources, routes, people, use, and treatment or return.

What happens if one route breaks, if a home is far away, or if new people move in? Engineers need to learn from the community as well as analyze the system.

Choose a Starting Point

Story connection

A new neighborhood has homes, a school, gardens, and workplaces. A nearby water source has no distribution system. Where should the water go and what would you ask residents before designing?

Real-world connection

Families may receive water through pipes, wells, shared sources, or storage. Ask where your water comes from, which community places need it, and who helps maintain access.

Ask Your Child

- Where would people need water in a new community?
- Does everyone use water in the same way?
- What could make water harder for some people to access?
- Who should engineers listen to when designing a system?

Meet Water Engineers

Brook Thompson - Environmental Engineer

Her work integrates water engineering, Indigenous knowledge, water rights, public policy, and Klamath River restoration. Ask: What could engineers learn from a community with generations of river experience?

Aria Harris - Water Infrastructure Design Engineer

Connects water-infrastructure engineering with equity, sustainability, and community well-being. Ask: Could a design technically work but still be unfair to some people?

LESSON 5 / FAMILY ENGINEERING ACTIVITY

Water for Everyone - Let's Engineer!

YOUR CHALLENGE: Design a community water system that serves different people and places - and adapt it when needs or conditions change.

Open Challenge

Set up and explore

Imagine a new community. Draw or build a system with one water source, at least three places needing water, and a way to move water from the source to all three places.

What to Do

1. Ask Who lives in the community? Which places and people need water?

2. Imagine Where should the source and destinations be located? How could they connect?

3. Create Draw, build, or tell the story of a water system with clear connections.

4. Test Trace the routes with your finger, arrows, or a small amount of real water. Who is served? Who might have difficulty?

5. Improve Adapt the system for a need or problem you discover and explain the change.

Make It Your Own

Getting started

Begin with one source, three destinations, and arrows to show water flow. You do not need to test with real water.

Ready for more?

- Add a family far from the water source or a resident who cannot carry heavy containers.
- Include a school, clinic, community garden, or people who use wheelchairs.
- Invite a community member's perspective and redesign based on their input.

The Surprise Test!

Once your child has a design, introduce just one unexpected change. Ask how they would adapt their system.

- More families move in.

- The dry season reduces water supply.
- One route becomes blocked or a part breaks.
- A big storm arrives.
- A busy school suddenly needs more water.
- A home is farther away than expected.

Trace the new water route or explain how it would work. The goal is to discover how engineers adapt when circumstances change.

Talk About It

- Who did you design the system for, and who might be left out?
- What happens if an important connection breaks?
- What did previous water lessons teach you about this challenge?
- What changed after your surprise test?

Before You Finish

How did your design change when you considered more people's needs?

Invite your child to share discoveries through conversation, drawing, writing, photographs, pointing, or building. Record ideas in your Unit 2 Engineering Notebook if you wish.

Safety Reminder

Water is optional. Trace the flow on a drawing instead if that works better for your family. If testing with water, use only small quantities and keep away from electrical devices.

ENGINEERING DESIGN PROCESS ASK > IMAGINE > CREATE > TEST > IMPROVE

Optional: Family Notes and Sketches

Use this space for a quick drawing, a question, or something you noticed while engineering together.