

Lesson Title	Try Engineering: Irrigation Ideas
Grade Level(s)	6-12
Timeline	2 45-minute class periods

ESSENTIAL QUESTION

How can we, as humans, use engineering design to manipulate nature to fit our needs?

OBJECTIVES

Students will learn how irrigation systems move water from one location to others where it may be needed for farming or other purposes. Students will work in teams to design and build an irrigation system out of everyday items, test their system, evaluate their own results and those of other students, and present their findings to the class.

STANDARDS

SGE6b. Design and evaluate solutions for sustaining the quality and supply of natural resources such as water, soil, and air.
SSWG1h. Describe the spatial distribution of natural resources, including, but not limited to, fuel and energy, agricultural, and mineral sources. Predict how distribution of natural resources continues to impact global settlement patterns.
SSWG5a. Describe how and why agricultural techniques and technology have changed over time (e.g., irrigation, crop rotation, green revolution, and GMOs)

BACKGROUND

Irrigation is a system that artificially routes water to an area where it is not naturally present. More common applications are in providing water to remote or dry land for growing crops. Irrigation is frequently used to compensate for periods of anticipated or emergency drought, but also is used to protect plants against frost. Irrigation systems are also used to help suppress the growth of weeds in rice fields. There are many different irrigation techniques to route water from a source to its destination. Usually, uniformity in water placement is a goal, especially for growing crops.

MATERIALS

- [Student Resource Sheet](#)
- Water basin and water for testing student irrigation systems
- One set of materials for each group of students:
 - Straws, cardboard or paper cups or bowls, clay, tubes, aluminum foil, rubber bands, tape, jars, toothpicks, glue, paperclips, plastic piping, tape, and other materials



VOCABULARY

irrigation: to supply (something, such as land) with water by using artificial means (such as pipes)

PROCEDURES

1. Show students the various [Student Reference Sheets](#). These may be read in class, or provided as reading material for the prior night's homework.
2. Divide students into groups of 2-3 students, providing a set of materials per group.
3. Explain that students must work as a team to design an irrigation system to move two cups of water a distance of at least three feet. The team has a goal of splitting the water into two separate containers of exactly one cup each.
4. Students meet and develop a plan for their irrigation system. They draw their plan, and then present their plan to the class.
5. Student groups next execute their plans. They may need to rethink their design, or even start over.
6. Next, teams will test their irrigation system to see how it works. Students will measure how much water is gathered in each of the two destination containers and see how close their water is to the goal of one cup in each container. Student teams may test their systems three times and count the most successful test.
7. Teams then complete an evaluation/reflection worksheet, and present their findings to the class.

ASSESSMENT/CLOSING

Have students answer the following questions as a ticket-out-the-door:

1. Look at a population map of the United States from 1900. What geographical feature were cities often formed around? Why?
2. Give two examples of modern irrigation systems that are used in agriculture.

EXTENSION

- For older students, the challenge might be to split the water into three destination containers, or to adjust the ratio of water between the two destination containers to 75% and 25% instead of 50% and 50%.
- If more time is available, have the students consider making the most complicated irrigation system they can imagine – along the lines of a Rube Goldberg machine. A Rube Goldberg machine performs a simple task in a complex way.
- Consider setting a budget for the project, assigning a cost to each material, and requiring teams to “buy” materials from the teacher to create their irrigation system.

RESOURCES

Tryengineering.org