

Drinking water is everywhere, right?

Objectives

In this unit, students will

- Learn about reservoirs and dams and understand how they work
- Research freshwater resources and reservoirs in their current state
- Learn details, analyze data, and hypothesize trends about the largest reservoir in the US (Lake Mead/Hoover Dam)
- Learn about the Sioux Tribe, Lake Oahe, and discuss arguments about Dakota Access Pipeline at Standing Rock
- Learn about environmental racism and environmental justice
- Learn about algorithms and flowcharts

Lesson Resources

NatGeo: What is a Reservoir?	Map of Oil Pipeline Spills	Dam Flaws Image Reservoirs Graphic	List of Largest Reservoirs in the US
NatGeo: Dams General Dam Components	National Water Information System: Mapper	DAPL and Sioux Country Map #1 DAPL and Sioux Country Map #2	Environmental Justice Worksheet
Video: Why Do We Build Dams?	Hydroelectric Dam #1 Hydroelectric Dam #2	Sioux People Facts Native Americans: Sioux Nation Facts	What is environmental racism?
Lake Mead Data Video	Dakota Access Pipeline explained: What you need to know	The Dakota Access Pipeline	Flow chart Basics Document

Lesson Descriptions

DAY 1

Essential Question(s): What is a reservoir? What is the purpose of reservoirs? What is the purpose of dams?

Main Activity: Students will learn the basics of reservoirs from reading and video resources, how they are created, how they work, and their purpose. Learn the history of dams from reading and video resources, what materials are/have been used to build them, and their purpose.

CRCS Framework Connection: Core Component 3

Potential Instructional Strategies to Use: Think-Pair-Share, Close Reading, K-W-L, Concept Map, Graphic Organizer, Guided Notes, Exit Ticket, Word Wall

Debrief: What is one portion of a reservoir and its function? What is one fact about the history of dams?

DAY 2

Essential Question(s): What is an algorithm? What is one fact about dams and one fact about a reservoir? How do flowcharts work?

Main Activity: Students will review the basic information about reservoirs and dams, how they are created, how they work, and their purpose. Students will then learn about the basics of flowcharting and (We do) a flowchart together on the following (brushing your teeth). Students (I do) will then create their own flowchart of how a reservoir and dam work. Students will go home and discuss with their parent/caretaker/family how to cook rice and create the algorithm by creating a flowchart to share in class the following day.

CRCS Framework Connection: Core Components 3, 4, and 5

Potential Instructional Strategies: Graphic Organizer, Think-Pair-Share, Self-Explanation, Jigsaw, Word Wall, Gradual Release, Exit Ticket, Unplugged, Worked Examples

Debrief: What is the purpose of flowcharting? What is the geometric shape of a process block?

DAY 3

Essential Question(s): What is the largest reservoir in the US? Where are the reservoirs located in our town/city/state?

Main Activity: Students will share the rice cooking flowcharts and discuss similarities and differences between the algorithms. Students will learn about Lake Mead (Hoover Dam) through video and explore websites with data. They will examine trends in water levels and hypothesize future water levels (in 1 month, 3 months, 6 months, and 1 year) based on data. Students will learn why access to freshwater is important for towns and cities. Students will research freshwater resources and reservoirs in or near their town/city and also state and examine their water levels.

Supplementary Resource: Bring in a guest speaker from the EPA, a dam builder, or a scientist who studies freshwater ecosystems.

CRCS Framework Connection: Core Components 3, 4, 5, 6

Potential Instructional Strategies: Jigsaw, Exit Ticket, Guided Notes, Self-Explanation, Case Studies, Anticipation Guide, Blender, Close Reading, See-Think-Wonder, Peer Review

Debrief: What is an example of data about a freshwater resource in or near our town/state/city? What is one fact about Lake Mead you learned today?

DAY 4

Essential Question(s): Why are people protesting at Standing Rock (Lake Oahe reservoir)?

Main Activity: Students will review information from previous days about reservoirs and dams. Students will learn about the 1841 treaty, basic history, and information about the Sioux tribe, their culture, and customs. Students will learn what environmental racism is. The class will read together the articles about the Dakota Access Pipeline and look at maps of the pipeline and Lake Oahe. Discuss as a class the articles and about environmental racism. Students will look over the oil spill map and small groups and compare how an oil spill potentially impacts Sioux tribe members and other wildlife surrounding Lake Oahe.

CRCS Framework Connection: Core Component 1, 3, and 4

Potential Instructional Strategies: K-W-L chart, Close Reading, Concentric Circles, Fishbowl,



See-Think-Wonder, Exit Ticket, Guided Notes, Graphic Organizer, Concept Map

Debrief: What are the potential issues with building an oil pipeline near a reservoir?

DAY 5

Essential Question(s): Why are people protesting at Standing Rock (Lake Oahe reservoir)?

Main Activity: Students will review information from the previous day and learn about the Dakota Access Pipeline, the 1841 treaty, the Lake Oahe reservoir, and oil spills. Students will learn more about the Sioux tribe, their current population, and their current-day lives near Lake Oahe. Students will discuss in groups to estimate how many people would lose access to freshwater because of an oil spill near Lake Oahe. Students will work in pairs to develop another safer pathway for the oil pipeline as well as develop at least one algorithm with an input of an oil spill and how that changes their reservoir/dam flow chart algorithm.

CRCS Connection: Core Components 3, 4, and 5

Potential Instructional Strategies: Concept Map, Graphic Organizer, Concentric Circles, Simulation, Barometer, Storyboarding, Simulation, Gallery Walk

Debrief: What are the potential issues with building the Dakota Access Oil Pipeline?

DAY 6

Essential Question(s): What can you do to help others understand environmental racism?

Main Activity: Students will review information about the Sioux tribe, their current population, and their current-day lives near Lake Oahe. Students will work in pairs to develop another safer pathway for the oil pipeline as well as develop at least one algorithm with an input of an oil spill and how that changes their reservoir/dam flow chart algorithm. Students will present this information in an infographic.

Supplementary Activity: Bring in a guest speaker of the Sioux tribe or any protesters at the Dakota Access Pipeline.

CRCS Connection: Core Components 1, 3, 4, 5, and 6

Potential Instructional Strategies: Concept Map, Graphic Organizer, Concentric Circles, Simulation,

Barometer, Storyboarding, Simulation, Gallery Walk

Debrief: How is the oil pipeline at Lake Oahe (Standing Rock) an example of environmental racism or justice?

Extension Activities

- + Students can build/draw a model of their reservoir/dam labeled with a flow chart
- + Students can research updates on Standing Rock, famous people who joined the protest, and what the current situation looks like
- + Students can do additional research on the Sioux tribe to learn about their general customs, culture, and history
- + Students can research other Native American tribes that are having their water sources threatened
- + Students can research freshwater access in Flint, Michigan, and compare the various aspects of it to the Standing Rock (have there been protests, how much of the population is impacted, what mitigation strategies have happened, how this is an example of environmental racism, etc.)

Differentiated Activities

- + Students can build/draw a model of their reservoir/dam labeled in their native language
- + Students can create a flowchart of two daily tasks (getting dressed, getting to school, getting their lunch at school, etc.) in their native language
- + Students can research the Sioux tribe to record three general customs, name of their language, population total, and name of two of the tribe's leaders (past and present)
- + Students can research another aspect of environmental racism that has/is happening near their town/city/state.

Vocabulary

- reservoir: large natural or artificial lake used as a source of water supply and electricity
- cistern: tank used in dams to store water
- dam: barrier constructed to hold water back and raise its level to form a reservoir
- pipeline: a long pipe underground that is used to help move oil or gas from one place to another
- treaty: a formal concluded and ratified agreement between two or more parties; legally binding written agreement between groups
- freshwater: found in glaciers, lakes, reservoirs, ponds, rivers, streams, wetlands, and even ground water; water containing less than 1000 mg per liter of salts
- pollution
- cartographer: person who draws and creates maps

- Sioux tribe; are groups of Native American tribes and First Nations people in North America with two major divisions the Dakota and Lakota
- flowchart: a diagram of steps to complete a process or algorithm
- algorithm: a set of steps or process needed to solve a problem or complete a task
- hydroelectric dam; constructed for the purpose of creating electricity from a large body of water
- environmental racism: institutional rules, regulations, decisions, and policies related to the environment that deliberately target racially marginalized people groups
- environmental injustice: set of actions that harm both the environment and racially marginalized people groups and communities

Standards

- NGSS-5-ESS2-2 Earth's Systems
- CCSS.Math.Content.5.OA.A.2
- CCSS.ELA-Literacy.RI.5.3
- CCSS.ELA-Literacy.RI.5.7
- K12 CS Framework 5th Grade: Algorithms and Programming