Vocabulary

WaterWays

Aqueduct	A pipe or channel for moving water to a lower level, often across a great distance. This method dates back to Roman times.
Buoyancy	The tendency of a body or object to float or rise when submerged in a fluid.
Canal	An artificial waterway constructed for use by shipping, for irrigation, or for recreational use. It may take in parts of natural rivers along its course.
Dam	A barrier of concrete or earth that is built across a river or stream to obstruct or control the flow of water, especially in order to create a reservoir.
Filter	A devise for removing particles.
Gravity	Any influence or agency that causes objects to move or tend to move toward the center of the earth as a result of gravitation.
Hydroelectric	Relating to, or used in the production of electricity by water power.
Irrigation	To bring a supply of water to a dry area, especially in order to help crops to grow.
Lock	A short section of a canal or river with gates at each end and a mechanism for letting water in and out in order to raise or lower water level.
Pipeline	A pipe or system of pipes designed to carry something such as water, oil or natural gas over long distances, often underground.
Plumber	Someone who installs and repairs pipes and fixtures, especially for water or drainage in a building.
Plumbing	A system of pipes in a building for supplying and carrying off water.
Pumping	Use of a mechanical devise to draw up or push water from its source.
Scientific Method	A way of problem solving that follows steps similar to—identifying a problem, gathering information about the problem, forming a hypothesis, performing experiments to test the hypothesis, recording and analyzing data, stating a conclusion and repeating the work.
Water Pressure	Force applied to something from the weight of water.
Water Wheel	A wheel made to rotate by direct action of water.

CHICAGO CHILDREN'S MUSEUM

Activity: Chicago Connections!

WaterWays

Water is at the heart of Chicago! Studying water is a great way to introduce and deepen your students' knowledge of both present and past Chicago. Consider learning a little more about Chicago by having students research and write about one of the following Chicago water connections or read about one as a class.

The Chicago River: This river runs through Chicago and splits into different branches. Civil engineers successfully reversed the flow of the river in the late 19th century. How did they accomplish such an engineering marvel? Why did they do this?

Bascule Bridges: The Chicago River runs through the downtown Loop. Bascule bridges were built to open and close to allow pedestrian traffic over the river and tall boat traffic under the bridge. How does a bascule bridge work? How many does Chicago have?

Lake Michigan: Lake Michigan is one of the five Great Lakes. Through it we can connect to the other Great Lakes and eventually to the Atlantic Ocean. This is very important for commerce. What path might a boat take to travel from Chicago to the Atlantic Ocean? What other bodies of water would you pass through?

The Chicago Water Tower: This landmark Chicago building is famous for being one of very few buildings to survive the Chicago fire. The tower contained a standpipe, which was needed to control water pressure. How does a standpipe work? Why was this building able to survive?

Chicago Harbor Lock: This lock is just south of Navy Pier and can be seen from your workshop room! The Chicago Harbor Lock controls the flow of water from Lake Michigan to the Chicago River. Why is a lock necessary? How does a lock work?

Chicago Drinking Water: Chicago and many suburbs get their drinking water from Lake Michigan. Water is gathered at intake cribs off shore and eventually comes out of your faucet at home. What route does the water take to get there? Where does it stop along the way?

Buckingham Fountain: This famous Chicago fountain was built in 1927 and sits in Grant Park. The fountain uses 3 pumps and over one hundred jets to create the unique water display. How many gallons of water does the fountain use? How is the design of the statues significant to Lake Michigan?

Alignment with State Goals

State Goal 3
Write to communicate for a variety of purposes

State Goal 5
Use the language arts to acquire, assess and communicate information

State Goal 16 A
Apply the skills of historical analysis and interpretation

State Goal 16 E
Understand Illinois, United States and world environmental history.

State Goal 17 C
Understand relationships between geographic factors and society

CHICAGO CHILDREN'S MUSEUM

Activity: Water Exploration Station

In this activity, students can investigate the way that water moves and how we can control and direct water. Students will also become familiar with tools that are similar to those they might use in the Waterways Workshop.

Preparing a Water Exploration Station

1. Collect items from around the house that might be useful for creating a Water Exploration Station.

Ideas:

Large buckets	A water table, or plastic tub
Measuring cups	Turkey basters
Eye droppers	Funnels
Strainers	Plastic cups or pitchers
Sponges	Objects that sink / float
Spray bottles	Straws or plastic tubes

2. Fill each water table or tub—these will be your stations. Distribute materials evenly to each station. Consider setting up outside where spills are not a problem.

3. Divide students into small groups and assign each group to a Water Exploration Station. Encourage students to play and experiment with the materials provided.

4. After allowing some time for free exploration, challenge each group to complete a specific task.

Here are a few ideas for challenges:

- If you pour equal amounts of water into the strainer and funnel, which will drain out first?
- How fast did the water move through the straw / plastic tube? Is there a way to speed the water up? What about slow it down?
- Can you make an object that floats sink? (or vice versa)
- Use the eye dropper to fill a plastic cup. Where does the water move as the drops collect in the cup?

5. Have each group report their findings back to the class. Ask them what they noticed about the ways that water moves.

Alignment with State Goals

State Goal 4
Listen and speak effectively in a variety of situations

State Goal 11
Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems

State Goal 12
Understand the fundamental concepts, principles and interconnections of the life, physical and earth/space sciences

State Goal 13
Understand the relationships among science, technology, and society in historical and contemporary contexts

Activity: Water Log

To build awareness of how they see and use water, have students keep a daily water journal. You can use the attached journal page or create your own. Younger students might draw a way they see water in their home or environment. Have students share their journal entries with a partner or with the class.

Making a Journal:

1. In their water log, have students list all of the places where they encounter water in the environment. (ex: rivers, rain, shower)

2. Place a bucket outside to measure and record rainfall or place a graduated cylinder of water in the classroom and measure the amount that evaporates each day.

3. Ask students to list the ways that they use water each day.

4. As a class, discuss the connection between the water we see outside and the water we use inside. Where does the water in your house come from? How does it get there?

5. Optionally, have students estimate the total number of gallons of water that they use each day by consulting the conversion table on the attached journal page.

6. Discuss why it might be important to conserve water. Challenge students to use less water the following day.

7. At the end of the week, consider making a graph of the total amount of water that your class used each day. Invite students to share the ways they cut down their water usage.

Extension: Invite a Guest!
Find out if there are parents in the class who work with water systems (plumbers, treatment plant employees). Invite them to come and share their knowledge with the class. Encourage them to bring tools or supplies that they can use to help demonstrate what they do.

Alignment with State Goals

State Goal 3
Write to communicate for a variety of purposes

State Goal 6
Demonstrate and apply a knowledge and sense of numbers, including numeration and operations

State Goal 7
Estimate, make and use measurements of objects, quantities and relationships and determine acceptable levels of accuracy.

State Goal 13
Understand the relationships among science, technology, and society in historical and contemporary contexts

State Goal 10
Collect, organize and analyze data using statistical methods; predict results, and interpret uncertainty using concepts of probability

Daily Water Log

Where did you SEE water in the environment today?

_____

_____

_____

_____

Water by numbers!

Centimeters of rain / snow _____

Centimeters of water evaporated _____

How did you USE water today?

_____

_____

_____

_____

Activity	Gallons per use	# Times per day	Gallons Used
Drinking Water	1/8 per glass		
Flushing Toilet	5		
Brushing Teeth (with water running)	2		
Dishwasher	20		
Washing dishes by hand	30		
Load of Laundry	40		
Shower or Bath	5 per minute water is running		
		Total =	

Water by numbers!

Use the chart to the left to estimate how much water you used today.

Example: If you brushed your teeth 3 times today, the total water used is 6 gallons

2 gallons x 3 uses = 6 gallons

If you used water in a way that is not listed on the chart, add this activity to the blank line and estimate how many gallons you might have used.

Activity: Be a Plumber

This activity is designed to get students thinking about how people access water in their own homes. Students explore the way that water moves through a system and use problem solving skills to design a would-be working system.

Materials

Plumbing diagram (included)
Pipe cleaners
Card stock or poster board
Scissors
Glue

Procedure

1. Give each student a home plumbing diagram. It might be helpful to glue this sheet down to something more sturdy (cardstock, poster board)

2. Explain that the pipe cleaners will represent pipes running through a building. Their job will be to "install" the plumbing system for the building.

3. Students will use the pipe cleaners to construct a piping system that will bring water to the various fixtures in the building. Students should tape or glue their systems down to the diagram.

4. Use different color pipe cleaners to represent hot and cold water. You will need a third color for drainage pipes (hint: these should always lead downward so that gravity can move the water). Keep in mind that hot water must pass through a water heater first and that some fixtures will require both hot and cold water.

*Students can also draw their piping system with colored pencils

5. Ask students to share their designs and explain why they connected the pipes the way that they did. Did they encounter any obstacles when making their pipe system?

Extension: Plumbing Tour

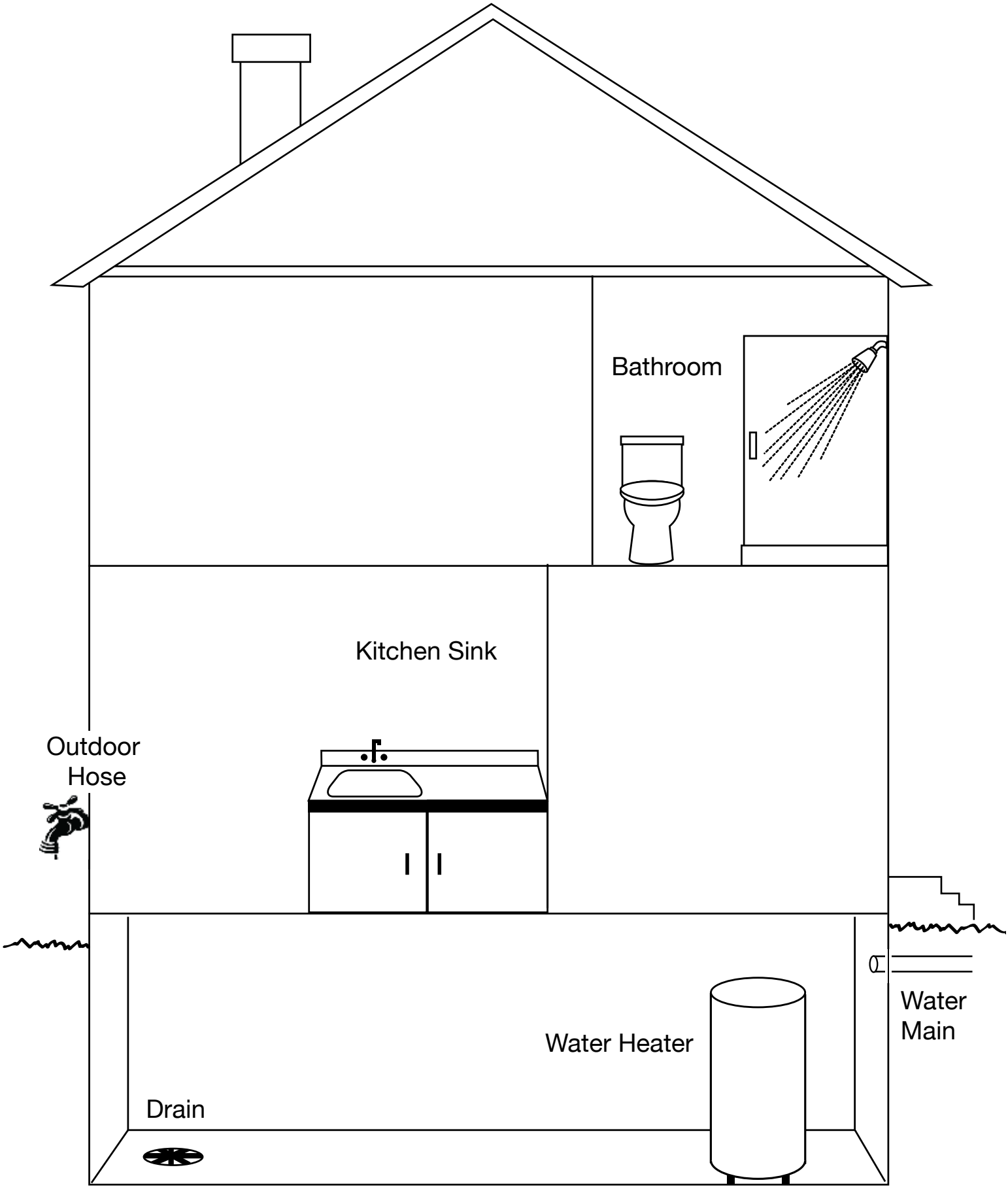
Consider asking a school janitor to take your class on a tour of the school's water system. Can your class find the water main? What about a water heater? How many pipes can you see?

Alignment with State Goals

State Goal 11
Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems

State Goal 12
Understand the fundamental concepts, principles and interconnections of the life, physical and earth/space sciences

State Goal 13
Understand the relationships among science, technology, and society in historical and contemporary contexts


Bathroom
Kitchen Sink
Outdoor
Hose
Water
Main
Water Heater
Drain

WaterWays

Activity: Storm Water Runoff Pollution

This activity introduces students to the concept of Nonpoint Source Pollution—what happens when rain washes garbage and other pollutants into rivers and lakes. Through this class demonstration, students will see how water systems are connected and how pollution in their own backyard can affect larger water supplies.

Materials

Large clear Tupperware	Spray bottle
Sand, grass clippings ("pollutants")	Cooking oil ("motor oil")
Food coloring ("pesticides")	Sprinkles ("fertilizer")

Vocabulary

Storm Water Runoff— rain or melted snow that does not seep into the ground and instead "runs off" across the ground into the nearest river or lake.

Nonpoint Source Pollution—Pollution that is picked up by storm water runoff and carried into streams, rivers, and lakes.

Demonstration

1. Fill the Tupperware with water to represent a lake or stream. Place the Tupperware lid (or other flat plastic surface) on top of something so that it slopes down slightly into the water. This represents the ground.

2. Invite students to dump each "pollutant" onto the plastic lid and observe the results. Spray the lid with water to represent a rainstorm. Observe what happens to the pollutants and to the lake water.

3. Ask the students to think about the way water sources are connected into systems. How can pollution on the ground travel to our water supply? Explain the vocabulary terms.

4. Brainstorm causes of nonpoint source pollution. Make a list of ways that kids and their families can help prevent water pollution. A list of ideas can be found at http://www.epa.gov/owow/nps/whatudo.html

Alignment with State Goals

State Goal 12
Understand the fundamental concepts, principles and interconnections of the life, physical and earth/space sciences

State Goal 13
Understand the relationships among science, technology, and society in historical and contemporary contexts

State Goal 17
Understand world geography and the effects of geography on society, with an emphasis on the United States.

CHICAGO CHILDREN'S MUSEUM

Activity: Aesop's Arithmetic

WaterWays

In this activity, students are introduced to the fable of *The Crow and the Pitcher*, found in most Aesop's Fables anthologies. In the story, a clever crow drops pebbles into a pitcher to cause the water level to rise. Eventually, the water is high enough for the crow to take a drink. Students predict and experiment to see how many pebbles it would take to create the same outcome as in the fable.

Materials

Small buckets or tall cups
Water
Pebbles or any other materials you have handy, like beans or marbles

Vocabulary

Volume—How much space an object occupies.

Displacement—When an object is added to a fluid, it pushes the fluid out of the way and takes its place.

Setup

1. Read the fable *The Crow and the Pitcher*.

2. Divide students into groups. Give each group a cup or bucket that is one quarter full of water and a supply or pebbles or other material.

3. Have students study the pebbles and think about how much the water level will rise with each additional pebble. Have them drop one pebble in and see how much the water rises. This is called water displacement. All objects that sink displace water relative to their volume. So, a bigger object displaces more water.

4. Have students predict the number of pebbles it will take for the water to rise to the brim. Record these predictions on the board.

5. Have students conduct an experiment to find out the actual number of pebbles needed. Assign one student to tally the pebbles as they're added.

6. Have students share their results with the class. Discuss what is interesting about the results. Who had the closest estimate?

Extension: Varying the materials

Have students list other materials with which they would like to try this experiment. If possible, gather these materials and repeat the process of prediction and experimentation. What material displaced the most water? Which displaced the least?

Alignment with State Goals

State Goal 1
Read with understanding and fluency

State Goal 10 A
Organize, describe and make predictions from existing data

State Goal 11
Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems

State Goal 12
Understand the fundamental concepts, principles and interconnections of the life, physical and earth/space sciences

CHICAGO CHILDREN'S MUSEUM

WaterWays

Activity: Wet Art

This water-centered art activity explores the properties of spraying and dripping water. Water makes different and beautiful shapes depending on how it's used. Students can experiment with color and patterns as they explore this artistic use of water.

Materials

Spray bottles
Liquid colors (or water and food coloring)
Muslin or other fabric
Pipettes
Tarps

Directions

1. Fill spray bottles with different colors of water

2. Prepare small cups with different colors of water to be used with the pipettes

3. Set up art stations with tarps, muslin, spray bottles, cups and pipettes. This is most easily done on the floor. However, if you can cover a wall and the floor beneath with a tarp and spray the muslin on the wall, you will get the added effect of drips and water in motion.

4. Explain to students that they are creating a wet art project using colored water drips and sprays. Show them how a spray bottle makes a pattern of color and the pipettes make small dots of color.

5. Allow students plenty of time to create their artwork

6. If possible, hang or tack the finished fabric up for display. Have students talk a bit about their piece. What does it look like to them? Maybe a stormy day or an ocean scene!

7. Optionally, have students create captions for the finished work including the artist names and their description of the artwork.

8. Brainstorm uses for the beautiful fabric pieces. (We like to use ours for tablecloths!)

Alignment with State Goals

State Goal 3
Listen and speak effectively in a variety of situations

State Goal 25
Know the language of the arts

State Goal 26
Through creating and performing, understand how works of art are produced

CHICAGO CHILDREN'S MUSEUM

Waterways Workshop Resource List

Fiction and Storybooks

- Brown, Stephanie. *Aesop's The Crow and the Pitcher*
- Cole, Joanna. *The Magic School Bus at the Waterworks*
- David, Erica. *Plumbing Problems; Flushed Away*
- Relf, Pat. *The Magic School Bus Wet All Over: A Book About the Water Cycle*
- Sobol, Donald J. *Encyclopedia Brown and the Case of the Exploding Plumbing*

Nonfiction and Reference

- Asch, Frank. *Water*
- Green, Jen and Mike Gordon. *Why Should I Save Water?*
- Edom, Helen. *Science with Water*
- New Book of Popular Science. *Just Add Water: Science Projects You Can Sink, Squirt, Splash and Sail*
- Parker, Steve. *The Marshall Cavendish Science Project Book of Water*
- Simon, Seymour. *Let's Try It Out in Water!*
- Strauss, Rochelle. *One Well: The Story of Water on Earth.*
- Wick, Walter. *A Drop of Water*

Websites for Students and Teachers

http://justkidsgames.com/play.php?WaterWorks
This website has fun water related games for students to play.

http://www.fi.edu/city/water
This website offers nice basic information on how cities move water.

http://www.epa.gov/safewater/kids/index.html
This website has a variety of activities and diagrams for students and teachers.

http://ga.water.usgs.gov/edu/
The U.S. Geological Survey's website provides in depth water related information in a variety of subcategories including a comprehensive glossary.