Be Water Wise

Be Water Wise is a unit offered by West Basin Municipal Water District to teachers in our service area. It is intended to guide teachers and students in learning about water resources in the Santa Monica Bay Watershed and Dominguez Channel Watershed. This curriculum specifically supports Next Generation Science Standards and is designed to be taught in conjunction to a tour at the Edward C. Little Water Recycling Facility.

Each lesson plan has been created with a specific grade level in mind, but can easily be adjusted to meet your classroom curriculum.

This four-day (including a tour at the Edward C. Little Water Recycling Facility) unit focuses on:

- Imported Water
- Conservation
- Ground Water
- Water Recycling

Our goal is to shape young minds into environmental stewards and truly *Be Water Wise*.

Pre-Tour Lesson Plan:

1. How Do We Get Our Water?
   NGSS 3-5-ETS1-1

Post-Tour Lesson Plan:

1. Conservation: Water Stars!
   NGSS 4-ESS3-2

Pre-Tour Lesson

How Do We Get Our Water?

INTRODUCTION:

This lesson is intended to be taught prior to a scheduled school tour at West Basin Municipal Water District's Edward C. Little Water Recycling Facility. This is an inquiry-based lesson where students will learn the most efficient way to move water. After completing a series of experiments, students will be able to formulate ideas on how water makes it to their homes.

LESSON OVERVIEW:

Grade Level & Subject: 3rd-5th grade

Length: Day 1- 30 minutes
Day 2- 2-3 hours

Standards Addressed:

- **3-5-ETS1-1.** Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

Curriculum Goals:

1. Students will better understand municipal water delivery systems.
2. Students will understand that water delivery to Southern California via aqueducts is a complex and expensive process, and through that…
3. Students will understand that water is a rare resource in Southern California.

Materials Needed:

- White or chalk board
- Water Fact Sheet- 1 per student
- 2 buckets for each group of students
    - 1 empty
    - 1 filled with water
- Water Engineers Sheet- 1 per student
- Additional supplies as determined by group discussion may or may not include:
    - Straws
    - Butcher paper (to recreate downhill mountains/river)
    - Cups
    - Hair dryer and cling wrap (to simulate evaporation and condensation)
    - 1 Experiment sheet for each student
    - See: Recommended Supply List

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Background:

- How does Los Angeles get its water? https://www.popsci.com/how-la-gets-its-water#page-8
- History | West Basin Municipal Water District http://www.westbasin.org/about-us-what-we-do/history
- Video: West Basin Municipal Water District: Benefits of Water Recycling https://www.youtube.com/watch?v=UXc6ZCOXoBY&t
- Facilities | West Basin Municipal Water District http://www.westbasin.org/water-supplies-recycled-water/facilities
- How does water get to my home? http://www.solar365.com/green-homes/the-house/how-does-water-get-to-my-home
- Water Jeopardy and answer sheet
- Water Reuse and Recycling: Community and Environmental Benefits https://www3.epa.gov/region9/water/recycling/#uses
- How Grey Water Reclamation Works https://science.howstuffworks.com/environmental/green-science/gray-water-reclamation1.htm

LESSON:

DAY 1- Introduction: **30 minutes**

1. Introduce the topic of water.
    a. Use a KWL chart to gauge student's ideas about water.
        i. Spend 5-10 minutes with students filling out the "K" section with what they already *know* about water and the "W" section with what they *want* to know about water.
    b. Hand out the Water Fact Sheet to each student. Explain that this is meant to help them start thinking about water. Have students work in groups to fill out the fact sheet together, then after 10 minutes review the correct answers.
    c. Tell them we will now spend the next week learning about water, starting with the main question: How Do We Get Water in Our Homes/Schools?
        i. Ideally, a student will have asked this question in the "W" section of the KWL chart.
        ii. This will allow you to refocus the class on answering the main question.
2. Guiding Discussion
    a. Ask the main question and have students brainstorm how water gets to our homes. Use questioning strategies to challenge students' thinking.

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i. Level 1: How does water get to our homes?
Sample dialogue flow: from the sink/shower/hose… from underground in the pipes…
ii. Level 2: How does water get to our pipes?
Sample dialogue flow: from the lakes/rivers, from rain/snow
- How do we move it from the lakes to our homes?

iii. Level 3: What is the best way to move water from one place to another?

b. Have students brainstorm different strategies on how to move water and write it on the board. The goal is to have at least 8 different strategies which may or may not include: connecting straws, using hands, using cups, pouring it down a mountain via a "river," making the water condense at a different location and moving it towards the other bucket, and more. Students are encouraged to think of "silly" and different ideas. Guiding questions:
   i. Why do you think your strategy is best for moving water?
   ii. Why is another strategy not as efficient for moving water?
c. Teachers are responsible for getting the supplies for each (plausible) strategy and updating corresponding "Water Engineers" experiment sheet for each strategy.

DAY 2- Procedure: **2 hours**

1. Have students break up into groups of 3-4 and choose two of the strategies to experiment with.
   a. Classes with older students may implement a "money" system where each group is given an equal amount of currency. They will then use their currency to purchase their materials, noting restraints due to high costs of materials.
      i. For an added bonus, energy can be added as a material. This will limit students to better understand energy requirements for water delivery systems.
2. Hand out the experiment sheet and read the instructions to them. Give the students 1 hour to conduct their experiments. Ensure that they work together and teachers are only available as a guide.
   a. "You will now think like water engineers, who we can thank for being able to shower and wash our hands every day! They are responsible for building everything that helps us get water."
3. After 1 hour, have the students come together and present their hypothesis, two strategies, and conclusion. As a class, decide what the best way to move water is.
   a. What made moving water difficult? What made it easy?
   b. How can we compare our experiment to real life?
   c. Optional extension: Water heater connection. Have students brainstorm how to reconfigure water delivery systems to deliver hot

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and cold water using valves. Have class discuss options, and have volunteers demonstrate reconfiguration with teacher assistance.
    i. What if we need to deliver heated water to our house? What if I don't need the heated water anymore, and want to use cold water?
    ii. How could we reconfigure, or re-eningeer our water delivery systems to bring both hot and cold water?
4. To wrap up, ask students guiding questions and facilitate a discussion. Rather than tell them the answers, have students discuss ideas with each other and guide them towards the curriculum goals.
    a. Level 1: What is the best way to move water?
        i. Your class will most likely have decided that moving water downstream through a series of pipes (or similar) is the best way to move water. This system is implemented through the use of aqueducts. From there, water reaches our homes through a series of smaller pipes.
        ii. Have students discuss the challenges in their experiments. Just like their challenges, there are a lot of difficulties in a complex aqueduct system! It requires a lot of energy, resources, and time.
    b. Level 2: Why do we need to move water?
        i. Because there is not enough groundwater and freshwater reservoirs in Southern California for the population. Water needs to be moved from other places to have enough for everyone who lives in Southern California.
    c. Level 3: What can we do so that we don't have to move water as much?
        i. Save water. Take salt out of ocean water. Recycle water. Find a way to get more ground water.

Conclusion: **30 minutes- 1 hour**

1. Optional: Water Jeopardy. This game serves as an additional resource to have students enjoy learning about where their water comes from, and will segue into their field trip at the Edward C, Little Water Recycling Facility.
    a. Play Jeopardy game provided by West Basin Municipal Water District. As concepts are difficult, teachers should create a "word bank" for students to choose from.
        i. Refer to answer sheet
        ii. For teachers who opt out of playing the game, it is recommended to go over "How Water Gets to Our Home" and "How Water Leaves Our Home" sections to students.
    b. Review "How Water Gets to Our Home" and create a layout of technologies that are used.
2. Video Conclusion

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a. Watch: The Colorado River Aqueduct by Las Virgenes Municipal Water District
https://www.youtube.com/watch?v=O-3jAQ5sd9g
b. How Water Gets to Your Home—And Back to the River by Epcor
https://www.youtube.com/watch?v=Msqu4cAQ76U
c. Optional Watch: California Water Story by California Department of Water Resources and talking points
https://youtu.be/Ozle7tS1SgQ

3. Introduce tour at West Basin Municipal Water District's Edward C. Little Water Recycling Facility.
   a. "One way to help save water and not have to waste energy and resources is by recycling the water that we do have. We will be taking a tour to see how it all works."
   b. Option to review Edward C. Little Water Recycling Facility Tour via video.
   https://www.youtube.com/watch?v=NGOP9r0gVvM
   c. Three types of water: discuss with students to prepare them for the tour at the Edward C. Little Water Recycling Facility. It is recommended to write the three types of water on the board along with visual representations to help students better understand its differences.
      i. Waste Water- Water that has been used by humans/animals/plants that cannot be used again because it is dirty. Includes sewer water and is also known as black/dark water. Ex: toilet water. This differs from gray water, which is water that has been used for less intensive purposes (showers, washing dishes, etc.) and can be repurposed for watering plants.
      ii. Recycled Water- Waste water that has been collected via a sewer/pipe system that has been sent to a water recycling facility to remove a large portion of its impurities. It is also known as Title-22/T-22/reclaimed/purple pipe water. It can be used for irrigation and industrial purposes. Some areas in the world make recycled water that is clean enough to drink (which we will sample at the Edward C. Little Water Recycling Facility), but West Basin is not yet legally allowed to sell this drinkable recycled water.
      iii. Drinking (potable) Water- Fresh drinking water is water that is clean enough to be used by humans for purposes such as farming, drinking, showering, brushing teeth, and cooking. It must meet federal and state levels of cleanliness. Drinking water includes bottled water.