Post-Tour Lesson

Conservation: Water Stars!

INTRODUCTION:
This lesson will guide students into concluding that freshwater is a scarce resource used by all living organisms and understanding the consequences of extracting it from distant locations. The instructor will guide the students into becoming leaders in conservation—both at home and in the classroom.

LESSON OVERVIEW:
Grade Level & Subject: 4th grade

Length:
- 4th grade- 1.5 hour class session

Standards Addressed:
- **4-ESS3-2.** Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

Curriculum Goals:
1. Students will view science as a tool for water conservation.
2. Students will be empowered with tools and ideas for conserving water.

Materials Needed:
- Large writing surface (i.e.; whiteboard or chalkboard)
- 1 large poster for each group of students
- Drawing materials
- Classroom Water Audit Worksheet
- Water Star Pledge
- Water Star Kit (provided by West Basin Municipal Water District)

Background:
- How We Use Water: https://www.epa.gov/watersense/how-we-use-water
- California limits personal water usage to 55 gallons: https://www.newsdeeply.com/water/articles/2018/06/20/california-limits-daily-personal-water-use-to-55-gallons-kind-of
- Direct Potable Reuse Vs. Indirect: Weighing the Pros and Cons https://www.wateronline.com/doc/direct-potable-reuse-vs-indirect-weighing-the-pros-and-cons-0001
- West Basin's Ocean Water Desalination Program http://www.westbasin.org/sites/default/files/08-21-17%20Desal%20Overview%20Fact%20Sheet_0.pdf

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- Hands-on Activity: The Dirty Water Project: Design-Build-Test Your Own Water Filters https://www.teachengineering.org/activities/view/cub_environ_lesson06_activity2
- C. Marvin Brewer Desalter Facility http://www.westbasin.org/c-marvin-brewer-desalter-facility

LESSON:

Introduction: Video. Water: Who Needs it? **15 minutes**
https://www.youtube.com/watch?v=tulDfG-8bjU

- Spend 5 minutes discussing the time they have spent over the past few days learning about water and where it comes from.
    - Level 1: How did engineers recycle water at the Edward C. Little Water Recycling Facility? Where did the water come from? What will the recycled water be used for?
        - Using a series of filters and additives (ferric chloride and synthetic polymer) helped clean the water. Water came from Hyperion Water Reclamation Plant, which cleans sewer water from the city of Los Angeles. Treated water can be used for irrigation or industrial processes, such as cooling towers.
    - Level 2: Why do the leaders at West Basin Municipal Water District feel it is important to recycle water?
        - Every drop of water recycled is a drop of fresh drinking water saved for human use! Water is a limited resource and we should work to conserve it.
    - Level 3: How can we also do our part to help conserve, or save, water?
        - Write down student ideas on white board to refer back to later
- Optional: Hands-on Activity: The Dirty Water Project: Design-Build-Test Your Own Water Filters.
    - Follow the lesson plan as stated. Have students complete the activity and follow up with a class discussion on the differences and similarities to their water filters (that reflect water filtration in nature) to what they learned at the Edward C. Little Water Recycling Facility.

Procedure: Classroom Water Audit **40 minutes**

1. Hand out the Classroom Water Audit to each student and read the directions. Recreate the grid on your whiteboard/chalkboard, or if possible, project it onto your screen.

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    - With the students, go through each "box" on the grid and have students raise their hand if they apply to that specific box. Count the applicable students and write it in the box.
        - The goal is to be accurate, so make sure each student is truthful. It's OK to take longer showers every once in a while!
    - Follow the directions at the right hand edge and bottom of the grid to determine how much water each student uses on average.
        - Calculators may be necessary to complete procedure.
2. Water Audit discussion. The average American uses 80-100 gallons of water per day. Your classroom may have a higher or lower number depending on the size of their home, outdoor water usage, energy consumption, and diet. Discuss the article provided with your students: *California limits personal water usage to 55 gallons.*
    - Guiding questions: Is 55 gallons a lot or a little compared to the national average to 80-100 gallons? Why is it important that people in California reduce their water usage? How did our water usage compare to the national average and the California limit? How can we lower our water usage?
    - Option to re-do the Classroom Water Audit with emphasis on water saving strategies (shorter showers, turning water off when brushing teeth, etc) and see how much water is saved.

Closing: Conservation Ideas **30 minutes**

1. Complete KWL chart from the pre-tour lesson. Give students 5-10 minutes to think about the past few lessons and fill out the "L" section for what they have learned. Hopefully, all of their questions will have been answered throughout the two lessons. Take additional time to review pertinent questions that may not have been addressed.
2. Introduce Water Star Kits that have been provided free of charge by West Basin Municipal Water District.
    - Free water conservation devices: toilet tank bank, fix-it-tickets, shower timer, leak detection tablets. Show how each device can help save water in their homes.
    - Water Star Detective booklet contains a series of activities that will help students learn about conservation strategies. There is a mystery riddle connected to all activities, and ends with an online video game. Students are encouraged to mail in or submit online the answer to the mystery riddle.
        - Instructors may give students some time to begin working on their booklets.
3. Discuss scientific advances in conservation (direct potable reuse and desalination).
    - We went over some ways that we can all do things at home and at school to save water. However, water scientists all over the world

are trying to discover different ways to make sure that we all have enough water!

- Desalination is a long word but when you break it down, de- means to remove, and sal means salt. When we look at it like that, desalination means to remove salt from saling groundwater, brackish water, and ocean water. Salt is generally found in ocean water, but can also be found in lakes and groundwater. Desalination can be done many ways.
  - Sailors from a long time ago just heated water up and used a weighted fabric or tarp to collect the fresh drinking water that evaporated up. Now, it's a long process of using a lot of filters that take out all the tiny stuff like dirt and salt out. Places in the middle east, like Saudi Arabia, have been doing desalination for hundreds of years. Now, West Basin Municipal Water District is looking at responsible desalination as a way to decrease independence on imported water from Northern California and the Colorado River.
  - Some cities in Florida, Texas, and New Mexico use desalination technology to provide their citizens with fresh drinking water. West Basin's Brewer Desalter has also been purifying groundwater for 25 years in the city of Torrance.
  - What are your thoughts on desalination?
- Direct potable reuse is also known as another phrase: toilet to tap! We went to the Edward C. Little Water Recycling Facility where sewage water was treated for use in big companies and for irrigation. At the end, we drank super clean water that was actually cleaner than the water we have at home! This water is supposed to be reinserted into the ground for groundwater recharge, but we actually make it dirty again through this process.
  - Some places, such as New Mexico and Texas, recycle water for direct potable reuse, meaning that it's clean enough to drink and use for daily activities like showering.
  - However, a lot of people don't like the idea that they're drinking water that was once in a toilet! However, keep note that water naturally recycles itself… and the water we're drinking could be the same water dinosaurs drank...and if they drank it, they had to pee/poop it out too!
  - What do you think about direct potable reuse?
- Video: Water Fix!: Crash Course Kids #36.2 https://www.youtube.com/watch?v=UYROQW9IDIg

4. Water Star Pledge
   - To complete the lesson, hand each student a Water Star Pledge where they can describe how they plan to protect our water supplies. Students are to write a pledge and create a drawing

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inside the star that depicts what water means to them and how it can be saved.

- Artwork can be hung in the classroom, or sent to West Basin Municipal Water District Education Coordinator Darryl Ramos-Young at the district office 17140 S. Avalon Blvd. Carson, CA 90746.