OXBOW "I See, I Wonder" TEACHER GUIDE

HOW MANY DROPS?

Grade	Standard/Element
6	S6E3a- Ask question to determine where water is located on Earth's surface (oceans, rivers, lakes, swamps, groundwater, aquifers, and ice) and communicate the relative proportion of water at each location..
6	S6E6b – Design and evaluate solutions for sustaining the quality and supply of natural resources such as water, soil, and air

Main Ideas:

- *Water in Earth's processes*

Materials

- 1000 mL of water
- Food coloring (optional)
- 1000 mL beaker or jar
- 50 mL beaker
- 20 mL beaker
- Pipette
- Salt
- Sand and rocks or gravel
- cup
- Worksheets
- Calculator (optional)
- Pencil or writing utensil

*You may also choose to use a different measurement, such as cups to teaspoons.

Procedure

1. Start by asking students how they use water in their everyday lives. How do their uses change on a daily to weekly or monthly basis?
2. Add food coloring to the 1000 mL of water you've measured our and fill a container with the water. Show the class the sample and explain that this will represent all of the water on Earth. Ask students to define accessible. What does it mean for water to be accessible or inaccessible?
3. Tell students that the majority of the water on our planet is not actually freshwater. Most of the water on Earth is contained in the oceans – 97.1%! Ask students how many mL 97.1% is of the 1,000 mL model. Pour 971 mL into the largest beaker or container. Ask students if this water is usable for drinking, bathing, cooking, etc. Pour table salt into this sample and explain that ocean

water is salt water and without desalinization is not usable or accessible. Have students fill in the "Distribution of Water Table."

4. Have students calculate how many milliliters remain. This represents the amount of freshwater on our planet. In this model, 29 mL remains or 2.9% of Earth's water.
5. Of the remaining 29 mL, a good portion of this is frozen at the North and South Pole in the Arctic and Antarctic as glaciers and ice caps. Frozen water is not accessible because it is in its solid state as ice. 2.2% of Earth's water is frozen. Ask students to calculate how many millimeters 2.2% is in our 1,000 mL model. Pour 22 mL into the 50 mL beaker or the next largest container. Ask students what percentage of all freshwater is frozen. 22 mL out of 29 mL is frozen, so just over 75% (0.7586) of all freshwater is frozen. Have students complete table.
6. Ask students how many mL remain in our model. Only 0.7% of Earth's water remains, or 7 mL. Of the 7 mL remaining, 0.3% or 3 mL consists of groundwater. Deep groundwater is water stored in crevices of rocks or in the soil and is not accessible. Pour rocks and sand into a separate container or cup in layers and then pour some water to demonstrate to students how the water flows to the bottom of the cup and is not accessible below the sand, [soil], and rocks.
7. Ask students how much water is left. Only 0.004 or .4% remain of the sample. Other water sources make up .001 or .1% of the sample. Ask students what "other" water sources exist. Students may offer answers such as water in the atmosphere, or water contained in plants, animals, or soil, among others not listed here. Squeeze the pipette to suck up 1 mL of water.
8. The remaining water is the accessible drinking water on our planet. Ask students what percentage of all water is accessible drinking water. Does this seem like a lot or a little? Ask students if this concerns them or what might affect this limited supply. Students should start thinking about the water cycle and how the processes of evaporation, condensation, precipitation, and collection "recycle" this limited amount of water. Water is never created or destroyed, but rather cycled through these processes in the water cycle.
9. Have students think about other ways accessible drinking water may be affected. What negative effects could change or alter the amount of water that we can use? Students may list different types of pollution and types of pollutants.
10. Additionally, you can have students track their water use over the course of a week or month. Students, with parental permission, can check their water meter at home and document the data at the same time each day over a set period of time. Do they notice any changes in use? Students can then challenge themselves

to conserve water and set a goal of water usage and again track data from their water meter to compare with their first measurements.

DISTRIBUTION OF WATER TABLE

The model uses 1,000 milliliters to represent all of the water found on Earth. The actual amount of water contained on Earth is close to 332,000,000,000 cubic miles covering 71% of Earth's surface (Source: usgs.gov).

Water Source	**Percentage of Earth's Water**	**Model: milliliters (mL)**
Oceans	*97.1%*	*971 mL*
Frozen	*2.2%*	*22 mL*
Groundwater	*0.3%*	*3 mL*
Other	*0.1%*	*1 mL*
Accessible Freshwater	*0.3%*	*3 mL*

Extensions:

1. Research water pollution. What things contribute to water pollution? [GSE S6E6b]

2. Have them graph data from the following table about water use for irrigation. What trends do they see? What happens as we use more and more water for growing crops? [GSE S6E6b]

Irrigated Area by Region (1961-1990)

Area in Thousand Hectares – 1 Hectare = 2.471 acres

Region	1961	1970	1980	1990
World	138,989	167,803	209,716	244,305
Africa	7,410	8,483	9,491	11,235
Asia	90,166	109,666	132,377	155,009
Europe	8,324	10,355	13,979	16,744
North and Central America	17,949	20,938	27593	28,905
Oceania	1,079	1,588	1,684	2,133
South America	4,661	5,673	7,392	9,499
USSR	9,400	11,100	17,200	20,800

3. USGS – "How much water is in the Apalachicola, Chattahoochee and Flint rivers, and how much is used? See file for extension for gifted students.

Additional Resources:

- https://www.usgs.gov/special-topic/water-science-school/science/how-much-water-there-earth?qt-science_center_objects=0#qt-science_center_objects