"EVERY DROP COUNTS" DIP-NETTING

Grade: 3rd
Setting: Any Natural Area with Access to a creek or stream
Theme: Although it seems like there is a lot of water all around us, in reality there is not much usable, good quality water and therefore, "Every Drop Counts!"
Description: Students will learn about macroinvertebrates as a bio-indicator by using dip nets and microscopes to observe the water near them.
Recommended Time: 30 minutes to an hour (see note at end of lesson plan)
State Standards:

- **Life Science 3.2:** Different organisms vary in how they look and function because they have different inherited information; the environment also affects the traits that an organism develops. **Life Science 5.3.4:** Most of Earth's water is in the ocean and much of Earth's freshwater is in glaciers or underground.

MATERIALS LIST:

- Background Information folder
- Small world globe, 1 1000ml beaker, 1 50ml beaker, 1 eyedropper, container of ph testing papers
- 5 student tool bags: 1 dip net, 1 specimen box with magnifier lid, trays for scoop collecting, 2 small Petri dishes and 2 eye droppers, 1 pond book, 1 sensitive macro invertebrate chart
- 2 microscopes and white collection trays, 2 invertebrate keys
- small green washcloths to dry off equipment before repacking, plastic bag for wet cloths
- Sani-Hands for students to clean hands at end of activity

ENGAGE

1. Begin with this demonstration. *(Adapted from "Drop in the Bucket," Project WET, CEE)*
    - Hold up the globe and turn it around as you **ask** the students what makes up most of the surface of earth? *(Water… about 71%)*
    - Now show them the 1000ml beaker and fill it with pond water. This will represent ALL the water on earth.
        - **Ask** where is all of this water is located? (*oceans, lakes, rivers, ponds, glaciers and ice caps, and underground)*
        - This means that some of this 1000 ml is salt water and not usable for people, animals or crops.

- Pour 30 ml into the small beaker. Everything left in the big beaker is salt water and the water in the small beaker is fresh water. But some of the fresh water is frozen in the glaciers and ice caps.
- Pour out all but 6 ml of the fresh water.
- Now take the eyedropper and pull out 1.5ml of the remaining 6ml *(a full eyedropper is approximately 1.5 ml).* This represents the fresh water that is not frozen, and not underground…. The surface fresh water on earth.
- Now **ask** is all of this fresh, surface water good quality water?
    - Squeeze one small drop onto your fingertip to represent the good quality, fresh, surface water on earth.
    - **Ask** what they think of this demonstration.

Nat Note: *The story behind the story here is that although it seems like there is a lot of water all around us, in reality there is not much usable, good quality water and therefore, "Every Drop Counts!"*

2. Turn to the pond and **ask** is the pond water part of the fresh, surface water on earth? *(yes)*
    - **Ask** Do they think it is good quality water? (*The answer here is important because good quality does NOT mean it is drinkable.)*
    - Be sure to make the distinction between good quality and drinkable. If it is good quality we can use it for some crops and animals. But we do not drink the water unless it has been filtered and treated. They may have seen a sign at a campground saying the water is "not drinking water." This is what that sign means.

3. Explain that scientists test water by taking samples to their labs and doing chemical analysis to see if it is good quality.
    - There are also **bio-indicators** that we can look for in the field to see if the water is good quality. Show the card with the word "bio-indicator" and the definition on it to the group.

4. One **bio-indicator** is the macroinvertebrates that are living in the water.
    - Some invertebrates are very sensitive to pollution. If they are able to live in the water that is a sign the water is good quality for supporting life.

EXPLORE/EXPLAIN

1. Show the chart of the invertebrates that are most sensitive to pollution.

2. **Explain** that today they are going to sample this pond water and look for these bio-indicators.

Nat Note: *It is worth noting here the difference between "polluted" and "dirty". Water that is polluted has chemicals in it that can really hurt pond life. All water in nature is "dirty"—meaning that the water naturally mixes with mud and microorganisms. Good quality water is still "dirty" and not good for humans to drink unless treated and filtered.*

3. Split the students into groups of two or three.
    - **Demonstrate** how to use the dip nets and collection trays, and the specimen boxes. *(Ask the chaperones to take charge of the microscopes and work with the students to examine what they find. Ask the adults to use the invertebrate keys with the students to help them identify what they find.)*
    - **Explain** their goal is to search for macroinvertebrates and determine if the water quality is good in this location or not

4. Hand out equipment.
5. Allow time for the students to explore and use the equipment.
    - Float from group to group assisting with the collection of macroinvertebrates

6. When the time is up have al the students bring their materials to the chaperones and VNA.
    - Try to dry stuff off or pack it into the plastic bags. While they are doing that gather the group and share their notes and findings.

ELABORATE/EVALUATE

1. **Ask** the students what they found while dip-netting.
    - Is this water good quality? How do you know?

2. Talk about nature webs.
    - Who eats these little critters that we found today? If the water is polluted, will this affect the nature web? How do these littlest creatures influence all the structures of life they are finding at the pond today?

Note: This lesson can be used if Utilities is unable to provide their program on macroinvertebrates and stream health. Their suggested timeframe is an hour long, putting two groups of students together for rotations. This can be accomplished in a shorter timeframe, but 30 minutes is not really long enough for a lot of engagement.