BRIDGES

Lesson Plan: **Water Chemistry**

How healthy is this water and how can you tell?

Alignment with STEM Framework

Inventor **Tinkerer** **Investigator** **Conservationist**

Altruist **Designer**

Overview

Youth will collect samples from bodies of water and analyze the pH, turbidity, dissolved oxygen, nitrogen compounds, and temperature to establish the overall water quality. Youth will assess water quality, why the water is as healthy/unhealthy as it is, and consider the sources of the chemical indicators. This lesson builds on and uses the data from the micro-aquaria and macroinvertebrate lessons.

Practice Goals

- ☐ Analyzing questions and Interpreting data
- ☐ Obtaining, evaluating, and communicating information

Content Goals

- ☐ What are chemical indicators?
- ☐ How do you test for chemical indicators?
- ☐ What effects do chemical indicators have on environments?

Purpose

The purpose of this lesson is to have the youth learn how to collect, analyze and draw conclusions from data in the field. This lesson provides youth an opportunity to explore the human impact of stormwater runoff on the ecosystems and wildlife in the park.

Teacher Background Information

Chemical Indicators are substances and compounds in water that will give a visible sign about the concentration of different chemical substances, usually through color change during an indicator test. Depending on the amount of chemical indicators within bodies of water, you are able to tell the health of the body of water being studied. The different indicators the youth will be looking at are pH, turbidity, dissolved oxygen, nitrogen compounds, and temperature of or within water, which they will collect and test for concentrations within their extracted water samples.

Youth will look at the concentration of pH. The pH scale ranges from 1 to 14 with 1 being very acidic and 14 being very basic. Neither extreme is desirable for healthy water. The range of 6 to 8 indicates healthy water. Dissolved oxygen (DO), phosphates, and nitrogen are all observed in parts per million (ppm), and expected concentrations are between 4.0 to 12.0ppm, less than 1.0ppm, and less than 0.1ppm respectively. Turbidity is a measure of how much light protrudes through water. Youth will conduct a visibility test provided in testing kits to assess turbidity levels. The more visibility observed, the better. Colder temperatures are generally indicative of healthier water.

Affinity Goals

I can act like an **Altruist** by helping out scientists who are conducting field studies by aiding in sample and data collection and analysis.

I can act like a **Designer** by evaluating the chemical indicators in local bodies of water and planning solutions to address negative human impact.

I can act like a **TInkerer** by analyzing data received from chemical indicator tests and creating new contraptions or gadgets that can help manage the chemicals in local bodies of water.

I can act like an **Investigator** by analyzing materials collected in the field and communicating the results to a wider audience.

I can act like a **Conservationist** by researching pollutants in local bodies of water and surrounding habits.

I can act like an **Inventor** by analyzing data received from chemical indicator tests and creating new theories or ideas about how to manage pollutants.

Materials

- [ ] Data from micro-aquaria lesson and macroinvertebrate lesson acquired from the same local water source
- [ ] Water samples from local water (ideally youth collect samples themselves)
- [ ] Water quality testing kit for
  - pH
  - DO
  - Phosphorus
  - Nitrogen
  - Turbidity
- [ ] Temperature Probe
- [ ] Water Chemistry Data Collection handout
- [ ] Water Chemistry Powerpoint: View Here

Time Needed

Afternoon

Instructional Sequence

Teacher will:

- ☐ Review stormwater runoff with youth
- ☐ Teacher will explain to youth:
  - Different ways water can be assessed from an ecosystem standpoint.
  - How to use the water quality testing kits, probes, and record data will be modeled for the youth.

Youth will:

- ☐ Use Water Quality Testing kits to investigate local water sources and record data.
- ☐ Collect data from upstream and downstream.

Teacher will:

- ☐ Bring the group back together around a whole-group data sheet. Teachers will ask youth to share what their BMP is (the actual name, like cistern) and what they observed when testing it. Add youth ideas to the data sheet.
- ☐ Lead group in a discussion:
  - What do you notice?
  - What worked well? What didn't? Why do you think that happened?
- ☐ Once youth understands what works and what does not, the teacher will split youth up into smaller groups and assign each group their own EnviroScape.
- ☐ Youth should now understand what each BMP does and what works best.
- ☐ Groups will choose 12 BMPs to place on their own EnviroScape and they will test the effectiveness of their selections and record their observations.