**Is this Stream Healthy?**

Audience: 6th grade
Time: 3 hours
Location: Dogwood Nature Center

DCI: Life Science - Ecosystems - Ecosystems Dynamics, Functioning, and Resilience (LS2.C)
Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. (MS-LS2-5)

Learning Objectives:

- Students will be able to describe characteristics of a healthy stream.
- Students will be able to identify different macroinvertebrates living in the stream.
- Students will practice various water chemistry tests and determine if each test result is within a healthy or unhealthy range.
- Students will determine if the studied stream is healthy or unhealthy based on their water chemistry results and macroinvertebrate survey.

Program Outline:

1. Walk students to the stream access point and ask them to describe characteristics of a healthy stream. Based on the characteristics they shared, ask them to predict if the stream is healthy or unhealthy.

   What makes a habitat healthy? (Essential Question/Phenomenon)
   What living and non-living things make up this stream habitat? (Descriptive)

   **SYSTEMS AND SYSTEMS MODELS** - expand on this and ask each student or pair to draw all the components of the stream system

   **Develop and Use Models**

   How do those habitat elements interact and impact each other? (Prediction)

2. Ask students how scientists can determine the health of the stream. Today we will be looking at the macroinvertebrate population and water chemistry to learn about the health of this stream.

   Share the available materials and their purpose. Materials include stream health indices created from data collected by scientists. One index determines the health of the stream based on the macroinvertebrate population, the other based on water chemistry properties. Compare the two indices with partners. What relationships do you notice between the two? (Correlative)

**PATTERNS**

**Ask Questions and Define Problems**
**Planning and Carrying out Investigations**

3. Macroinvertebrate Survey
    a. Define a macroinvertebrate and talk about how some are sensitive and some tolerant to poor conditions and how the presence or absence of different macroinvertebrates can tell you if a stream is healthy or not.

Which macroinvertebrates live here? (Descriptive)

**SCALE, PROPORTION, AND QUANTITY**

    b. Show students how to conduct a macroinvertebrate survey and use the ID cards.

Ask students to design the investigation given the materials we have.

- What are we measuring?
- Show the physical boundaries of the investigation. How should we design our investigation to record all the macroinvertebrates that live within this stretch of the stream? How should measurements be taken? Where? How many?
- What should be recorded on our data sheet besides the macroinvertebrates? What other variables could affect today's investigation? (location, date, time)

**CAUSE AND EFFECT** - how might these variables change our data?

**Ask Questions and Define Problems**
**Planning and Carrying out Investigations**

    c. At the end of the survey, ask students to share what they found and explain why they think this stream is healthy or unhealthy.

Share results. How should our data be compiled - totals present, average? (Organizing Data)

Using the health index, what does our data tell us about this stream? (Interpreting Data)

Our original question was: what makes a habitat healthy? Ask students to make a **claim**, supported by the **evidence** they just collected and with **reasoning** that connects their evidence to the claim.

**Analyzing and Interpreting Data**
**Use Mathematics and Computational Thinking**
**Construct Explanations**

4. Water Chemistry Tests
    a. Tell students about the following water chemistry tests and why they are important: Temperature, Dissolved Oxygen, Salinity, Nitrogen and Phosphorus.

What is the water chemistry of this stream? (Descriptive)

**SCALE, PROPORTION, AND QUANTITY**

    b. Show students how to perform each test and break them into small groups to complete one test and then share out their results to the larger group.

Ask students to design the investigation given the materials we have.

- What are we measuring?
- Show the physical boundaries of the investigation. How should we design our investigation to get an accurate recording of the water chemistry in this stretch of stream? How should measurements be taken? Where? How many?
- What should be recorded on our data sheet besides the test results? What other variables could affect today's investigation? (location, date, time)

**CAUSE AND EFFECT** - how might these variables change our data?

**Ask Questions and Define Problems**
**Planning and Carrying out Investigations**

c. Using tables, have students determine if each water chemistry test was Good, Fair, Marginal or Poor. As a group, students should determine if the stream is healthy or unhealthy.

Share results. How should our data be compiled - add all measurements together, find the averages? (Organizing Data)

Using the health index, what does our data tell us about this stream? (Interpreting Data)

Our original question was: what makes a habitat healthy? Ask students to make a **claim**, supported by the **evidence** they just collected and with **reasoning** that connects their evidence to the claim.

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5. At the end of the field trip, ask students to reflect on the day and decide if the stream is healthy or unhealthy and why.

How does the water chemistry data and macroinvertebrate data relate to each other? (Correlative)

**PATTERNS** - there is a diverse macroinvertebrate population where the water chemistry falls with the healthy range
**CAUSE AND EFFECT** - how are these indices related?

Ask students to make a new claim using both sets of data.

Extend the Investigation

- What factors in the field may have affected today's outcomes?
- Would the outcomes change in a different season? Why?
- How could you have better designed the investigation?

**SYSTEMS AND SYSTEMS MODEL** - students return to their original models of the stream system and add components they studied and draw relationships between different system components
**STABILITY AND CHANGE** - why and how might we expect changes to this system? (think back to the variables they included on their data sheets)

**Ask Questions and Define Problems**

**Develop and Use Models**
**Planning and Carrying out Investigation**
**Analyzing and Interpreting Data**
**Use Mathematics and Computational Thinking**
**Construct Explanations**