Grade 7-8

Title- Water Conductivity Testing by Jodi Berry
Objectives- Students will compare and analyze the conductivity of water samples.

Background: Conductivity is a measure of the ability of water to pass an electrical current. Conductivity in water is affected by the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, and phosphate anions (ions that carry a negative charge) or sodium, magnesium, calcium, iron, and aluminum cations (ions that carry a positive charge). Organic compounds like oil, phenol, alcohol, and sugar do not conduct electrical current very well and have a low conductivity when in water. Conductivity is also affected by temperature: the warmer the water, the higher the conductivity. Conductivity in streams and rivers is affected primarily by the geology of the area through which the water flows. Streams that run through areas with granite bedrock tend to have lower conductivity because granite is composed of more inert materials that do not ionize (dissolve into ionic components) when washed into the water. On the other hand, streams that run through areas with clay soils tend to have higher conductivity because of the presence of materials that ionize when washed into the water. Discharges to streams can change the conductivity; a failing sewage system would raise the conductivity because of the presence of chloride, phosphate, and nitrate; an oil spill would lower the conductivity.

The basic unit of measurement of conductivity is the mho or siemens. Distilled water has conductivity in the range of 0.5 to 3 µmhos/cm. Studies of inland fresh waters indicate that streams supporting good mixed fisheries have a range between 150 and 500 µhos/cm. Conductivity outside this range could indicate that the water is not suitable for certain species of fish or macroinvertebrates.

Alignment with MLR:
Science and Technology

B. ECOLOGY

Students will understand how living things depend on one another and on non-living aspects of the environment. *Balance in ecosystems is based on an intricate web of relationships among populations of living organisms and on non-living factors such as water and temperature. Changes in specific populations or conditions affect other parts of the ecosystem. Individual systems continually change in response to human and other factors.*

MIDDLE GRADES 5-8

2. Analyze how the finite resources in an ecosystem limit the types and populations of organisms within it.

5. Describe various mechanisms found in the natural world for transporting living and non-living matter and the results of such movements.

J. INQUIRY AND PROBLEM SOLVING

Students will apply inquiry and problem-solving approaches in science and technology. *Scientific inquiry, problem solving, and the technological method provide insight into and comprehension of the world around us. A variety of tools, including emerging technologies assist, the inquiry processes. Models are used to understand the world.*

MIDDLE GRADES 5-8

Make accurate observations using appropriate tools and units of measure.

1. Design and conduct scientific investigations which include controlled experiments and systematic observations. Collect and analyze data, and draw conclusions fairly.
2. Verify and evaluate scientific investigations and use the results in a purposeful way.

K. SCIENTIFIC REASONING

Students will learn to formulate and justify ideas and to make informed decisions. *This involves framing and supporting arguments, recognizing patterns and relationships, identifying bias and stereotypes, brainstorming alternative explanations and solutions, judging accuracy, analyzing situations, and revising studies to improve their validity.*

MIDDLE GRADES 5-8.

6. Support reasoning by using a variety of evidence.

7. Show that proving a hypothesis false is easier than proving it true, and explain why.

8. Construct logical arguments.

9. Apply analogous reasoning.

L. COMMUNICATION

Students will communicate effectively in the applications of science and technology. *Clear and accurate communication employs appropriate symbols and terminology, models, and a variety of media and presentation styles. Communication*

includes constructing knowledge through reflection, evaluation, refocusing, and critically analyzing information from a variety of sources. Individuals and collaborative groups must communicate effectively

4. Make and use scale drawings, maps, and three-dimensional models to represent real objects, find locations, and describe relationships.

Assessment- Graph displaying collected data and analysis of the data.

Prior Knowledge/Skills-Students will have an understanding of conductivity, and the environmental conditions that result in various conductivity levels.

Integration- Science and Technology

Modification- NA

Grouping- cooperative group; students will work in pairs or small groups depending upon the number of probes available.

Materials- water samples from studied lake
Tap water
Bottled water
Other various water samples
conductivity probe and data logger
Student laptops

Strategies: Review with students the definition of conductivity. Elicit all knowledge on the subject from the class. Students will use the sensor to find the conductivity measurements of water samples. Students will then create and analyze a graph of their data.

Game Plan:

1. Teacher will elicit prior knowledge and engage students in the task ahead. Ask the following questions: What does conductivity indicate? What are the causes of various conductivity values? What effect do you think the environment around our lake will have on the conductivity of this sample? How do you think the sample from our lake will compare to the other samples? Why?
2. Teacher will review the correct procedure for using the conductivity probe and entering the data into the program

3. Students will generate a hypothesis to answer the question of which water sample will have the poorest conductivity level.
4. Teacher will distribute water samples to students at their tables or set up at lab stations (make sure samples are labeled)
5. Students will use the conductivity probe to analyze each sample.
6. The students will create a graph from the collected data (this is computer generated, students did not have to create on their own)
7. Students will analyze the graph to determine which samples had the highest and lowest conductivity values
8. Students will write a conclusion from their data either proving or disproving their hypothesis. Conclusion should be based on collected data and graph analysis.