

## **Caleb W Stewart and Tegan “sassy pants” Van Artsdalen**

### **Lesson Plan**

**Grade:** 11<sup>th</sup> grade chemistry

**Time period:** 45 min

**Topic:** Mercury Pollution and Rates

### **Content Standards:**

- HS-ESS3-4 Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
- HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
- HS-PS1-5. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
- 3.4f The rate of a chemical reaction depends on several factors: temperature, concentration, nature of the reactants, surface area, and the presence of a catalyst.
- 3.3ix determine the number of moles of a substance, given its mass.
- 3.1pp The concentration of a solution may be expressed as: molarity (M), percent by volume, percent by mass, or parts per million (ppm).

### **Content Objectives:**

- Use the premade computational model to examine rates of mercury pollution in a point source and non-point source model.
- Gain an understanding about the environmental impacts of polluted water.
- Learn about elemental mercury and how it relates to moles and concentration.
- Be able to differentiate between point source and non-point source pollution.

### **Academic language:**

Point source pollution- Pollution that originates from a single source.

Non-Point source pollution- pollution that originates at one or more sources.

Molarity- Measure of concentration that evaluates the number of moles of a solution in given volume of solution, in Liters.

### Learning Tasks

Time	Activity
5 min AgentSheets intro	<ul style="list-style-type: none"><li>• Show students how to open agentsheets</li><li>• Make sure all students have agentsheets open</li><li>• Demonstrate to students how to adjust the speed slider and where it should be during the simulation</li><li>• Show students where the play button is and how to start and run the simulation</li></ul>
10 min Simulation	<ul style="list-style-type: none"><li>• Allow students to run through simulation of lake 1</li><li>• Rotate to answer questions about confusion</li><li>• Allow students to run through simulation of lake 2</li><li>• Rotate and answer questions about confusion</li><li>• Prompt students to record observations by asking, "What are you observing?" "what are some things that are different in lake 2 from lake 1?"</li></ul>
10 min Sample Data	<ul style="list-style-type: none"><li>• Show students excel sheet that contains data from the sample runs.</li><li>• Explain that the data was used to create graphs of pollution rates and fish death rates.</li><li>• Remind students that to obtain rates from the graph they can draw a normal line and use "rise over run" to come to a value.</li></ul>
15 min Worksheet	<ul style="list-style-type: none"><li>• Give the students the worksheet</li><li>• Have the students read directions carefully and complete the worksheet.</li><li>• Circulate and check for student understanding.</li><li>• Ask students "what are the units for that calculation?" to help guide them to the correct train of thought</li></ul>

10 min	<ul style="list-style-type: none"> <li>• Ask students to volunteer answers question by question</li> <li>• Ask students if they agree with the given answer</li> <li>• Review any questions that the class had confusion over</li> </ul>
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**Reflections:**

**Why this lesson is important?**

This lesson discusses chemistry as it relates to real life environmental problems. The lesson stresses how concentration and rate of diffusion are key factors of pollution in bodies of water. This lesson is also important in that it gets students working with academic material in a computational setting.

**How will you assess student learning? Formative? Summative?**

Student learning will be assessed formatively by having them answer questions and complete a worksheet. The teacher can formatively assess by asking students questions while they run the simulation and complete the provided worksheet.

**How will you use the concept of abstraction for teaching science and math?**

Abstraction will allow teachers to take concepts or scenarios that cannot happen during the day. Simulations allow the practice of difficult or impossible solutions to be evaluated in a manner that can aid students learning of abstract ideas.

**How will your lesson help students to improve math and computational thinking skill?**

This lesson allows students to gain familiarity with computational thinking. Students who have experience with this simulation will have a simple unimimidating introduction to computational science. Math skills will be assessed and strengthened through calculations and experience with the excel program.