**Teaching Science as Inquiry (TSI) Lesson Plan**

**Module 4: Ecological Aquatic Science**

Name: Florence Susan Togioka

Activity: Standing Waves

1. Why did you choose to do this activity?

I chose this activity because it connects to my current content standard 6 benchmark 10 Waves.

2. What are your classroom learning goals?

My classroom learning goals is to develop my ability to implement problem based inquiry science teaching practices effectively. I want students to formulate a working and testable hypothesis, and to test that hypothesis safely then analyze results and come to their own conclusions based on their learning. I want to help develop creative independent critical thinking students that will someday make me proud.

3. How does this activity tie into your classroom learning goals?

The activity Standing Waves will connect to my classroom learning goals as students demonstrate that they can formulate a hypothesis and test said hypothesis using equipment and tools safely as they manipulate a wave model to demonstrate their own knowledge of the nature and properties of waves creatively.

4. What date do you plan to start this activity?

I want to start this activity by May 2nd, 2013.

5. *If applicable:* HIDOE standards this lesson will address

Standards 1: Scientific Process

Standard 6: Nature of Matter and Energy

6. Describe how this activity relates to at least one of the TSIA PD Themes.

Themes: Community, Metacognition, Science as a Human Endeavor, Observations and Inference, Modeling Science, Scientific Language, Connections

This wave activity relates to Observations and Inference, Modeling Science,

**Ocean**

7. Describe how you will connect this activity to the ocean:

The Standing Wave activity will connect to the ocean as students look at the nature of waves, properties of waves and wave interactions and apply this knowledge to explain a tsunami, a giant ocean wave, to explain why tsunamis are so dangerous, and how do scientists predict when tsunamis will reach land?

8. Select the Ocean Literacy Principle(s) that you anticipate this activity will address. (Check all that apply)

□ 1. The Earth has one big ocean with many features.

□ 2. The ocean and life in the ocean shape the features of the Earth.

□ 3. The ocean is a major influence on weather and climate.

□ 4. The ocean makes earth habitable

□ 5. The ocean supports a great diversity of life and ecosystems.

□ 6. The ocean and humans are inextricably interconnected

□ 7. The ocean is largely unexplored

**Preparation**

9. How will you prepare your students for this activity? (For example, review of prior knowledge.)

This activity follows student reading text on waves, properties of waves, and wave interactions, wave like demonstrations with rope and slinky toys and wave tube with blue food colored liquid and Rheoscopic fluid.

We will begin the lab by observing closed test tubes that have Rheoscopic fluid and blue colored water in order to review their prior knowledge on waves. Students will be given a hand out with specific wave terms diagramed and labeled that they will fill in the missing term described. They will work in teams of 3 – 4 students. Students will review a textbook developed lab for background support. Student teams will chose jobs to be responsible for and begin.

10. Explain any instructional struggles that you foresee and how you will address these issues. (For example, student misconceptions, classroom discussion, aspects most difficult for students to grasp, etc.)

The instructional struggles that may occur will be when students realize that they need to improve on being self-directed learners and take on the responsibility of their own learning. This is where I will ask them to review the text book, notes and work together as a team to meet this challenge. I will also ask them what they see that they would change.

I will see frustration in possibly capturing the wave mark profile by students in the shallow pan I need to use, so I will encourage them to try different strategies and or ask them questions that will guide them to think of other ways.

11. What ***TSI inquiry questioning strategies*** will you use to help your students meet your learning goals?

What types of questioning or approaches to discussion will you take to support student

engagement and learning? See questioning handout for suggestions (Mod 3 Binder under “TSI Pedagogy and online in Mod 3 PD section)

The TSI inquiry questioning strategies that I plan to use will be lifting to elevate the level of discussion, summarizing, as I ask them to restate or summarize an elaborate on their answer focusing, to shift or initiate discussion back to topic, clarifying, as I ask them to further explain their initial response, extending as I push them for explanations and reflections and possible next times if they were to do this investigation again.

12. What ***TSI practices of inquiry teaching strategies*** will you focus on implementing to help your students meet your learning goals?

See TSI Practices of Inquiry teaching strategies handout for suggestions (Mod 4 Binder under “TSI Pedagogy” and online in Mod 4 PD section)

My TSI practices of inquiry teaching strategies focus will be on Teacher as Research Director.

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| Use the following table to plan your lesson using TSI.  For each phase:   * **Teacher:** Describe what you will be doing * **Student:** Describe what your students will be doing * **Assess:** Describe how you will assess your students in this phase so you can monitor their progress through the activity |

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| **INTERPRETATION** | | **INITIATION** | |
| Teacher | Teacher will give time to assess and evaluate data, reason through the steps of analysis; interpret the quality of procedures, results, and conclusions, guide students through diagraming of created watermark profile. | Teacher | The student’s teams will be handed a blue liquid tube to observe and take notes.  Students will be shown spring and slinky toy and asked if these objects could be used to make waves and to have students make predictions |
| Student | Students will evaluate whether data collection occurred as predicted, recognize discrepancies in data, identify error, variations, reason through the steps of analysis, interpret results and conclusion as they diagram their watermark profile, generate graph based on their collected data frequency to determine wave speed. | Student | Students will create their predictions for both day curiosity starters and generate observation notes in notebook |
| Assess | The students will be assessed through the activity results and conclusions for safety using lab materials and equipment, diagraming watermark profile, and completing the graphing of wave speed | Assess | Students will be assess by their engagement in the activity |
| **INSTRUCTION** | | | |
| Teacher | Placing the wave tube the first day and the spring and slinky toy out to create curiosity and begin the questioning from students. Students will be asked to make as many observations of the tube and spring and slinky toys. | | |
| Student | Students will begin asking questions, making observations, and connecting to other experiences and other students | | |
| Assess | Students will observe if that all students are simultaneous engaged in making observations | | |
| **INVESTIGATION** | | **INVENTION** | |
| Teacher | As the Teacher as research Director I will monitor and provide time for students to identify generate and test,  the practices of science, as they set up a pan of water then with pencils generate waves, observe the direction, determine wave speed and create a watermark profile of standing waves to measure wavelength, amplitute. | Teacher | The Teacher as Research Director will guide students through the development of hypotheses based on the extended question prior readings, demos and experiences as evidence. How are scientists able to tell how fast a wave travels, which direction, how large, and when is it going to hit land. |
| Student | Students will be gathering materials, setting up materials and equipment and working together as a team to acquire needed watermark profile  From a pan of water then with pencils generate waves, observe the direction, determine wave speed and create standing waves to measure wavelength, amplitude. | Student | Students will begin organizing reviewing materials, reading background information and forming their activity hypothesis |
| Assess | Students will be assessed on their safe handling of materials and equipment and acquisition of needed data | Assess | The students will be assessed through their engagement and their written formulated hypotheses |

11. Briefly describe how you will guide your students through the TSI Phases of Inquiry. (You are the research director of your classroom, and thus guide or facilitate the learning in your classroom, even if an activity is very student-directed).

Students will be guided through the TSI Phases of Inquiry, as Teacher Research Director of students as scientists in the classroom; application of disciplinary inquiry through the modes of inquiry. Listening to students carefully; accept what is heard, and then tie student responses to initiating questions; engaging students using questioning strategies to support student engagement and learning.

12. What *overarching* TSI mode(s) will you focus on for this activity? Why?

Modes: Curiosity, Description, Authoritative knowledge, Experimentation, Product evaluation, Technology, Replication, Induction, Deduction, Transitive knowledge

The TSI modes to be focused on is curiosity, authoritative knowledge, technology

Please provide any additional comments that will help you prepare to teach this activity or help the TSI facilitators understand how you plan to teach this activity.