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

**Module 4: Ecological Aquatic Science**

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Activity: Sampling for Abundance

1. Why did you choose to do this activity? It is a mandatory activity

2. What are your classroom learning goals?

I will be able to:

* Design an experiment to test the affect of sun angle on temperature
* Draw a conclusion about the relationship between sun angle and temperature

3. How does this activity tie into your classroom learning goals? It doesn’t

4. What date do you plan to start this activity? Thursday, May 9, 2013

5. *If applicable:* HIDOE standards this lesson will address none

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

I believe this activity most fittingly relates to the community theme because I designed the activity so that students were working in “research teams”. This allowed students to designate roles (data recorder, someone making readings, data analyzer, etc.) and encouraged them to work together in doing their best to sample the environment before them.

**Ocean**

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

The activity will be connected to the ocean because I will be presenting the environment in the room as the “ocean floor”, encouraging students to “name” the organisms they find in the environment accordingly.

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.)

Entering this activity, students are in the midst of a mini unit on sampling. They will have completed activities on both the capture-recapture method and on designing a sampling method to survey the population contained within a bag of m&m’s. I will introduce this activity as an extension of our exploration of sampling.

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.)

I anticipate some significant difficulties when it comes to analyzing the collected data. To remedy this, I intend to model how to do the required math with a sample row of numbers immediately before students begin their own process.

I foresee students having difficulty estimating “percent cover”, so I will explain it to them in the form of fractions, having them estimate how many of the 16 boxes (of the quadrat) an organism covers, record the fraction, and eventually convert the fraction to a decimal.

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)

There is one part of the lesson that I anticipate will be dominated by questioning strategies. This will be the “conclusion” of the lesson in which students process their data and talk about the accuracy of each of the sampling techniques. I will be using both extending and lifting questions during this time. Extending questions to make sure students think and talk about all of the strategies and situations in which each of them would be the optimal choice of a sampling strategy. I will use lifting questions to get students to think about the numbers in front of them and what those numbers mean when applied to the “blanket environment”, but also what those numbers mean about the efficacy of the sampling technique.

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

I will utilize the “Instructional Strategies” practice as I utilize a different method of instruction for this lesson. Instead of teacher communicated instruction, I will be having students pull critical and targeted information from a non-fiction text, working together to gather the necessary information before they do the activity. I will message this to students as a critical part of conducting a study – researching prior to the study to make sure your team understands the methodology of the study and everyone understands their role in the research.

I will also utilize the “Teacher as Research Director” practice as students generated, tested, and assessed their own hypotheses as well as the sampling techniques they used in their investigation.

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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 | Model data analysis, provide additional guidance to individual groups | Teacher | Observe students as they enter. Give them instructions to sit in groups and start reading packets. |
| Student | Analyze data and compare to what they see. Which technique was best? | Student | Observing the environment set up in the middle of the room |
| Assess | Can students assess the different sampling techniques and talk about which one would be best for a certain situation? | Assess | How are students reacting to the giant environment in the room? |
| **INSTRUCTION** | | | |
| Teacher | Has generated questions that get at the key information necessary for the activity and presented them on the board for students to answer | | |
| Student | Reading the packet of information on sampling techniques answering short answer questions | | |
| Assess | Are students engaged in reading and answering questions? | | |
| **INVESTIGATION** | | **INVENTION** | |
| Teacher | Circulate around room monitoring each group’s progress as they proceed with the 3 sampling techniques; provide pacing and guidance as necessary | Teacher | Select groups one at a time to examine the environment, giving them instructions to name the organisms and make predictions about their abundance |
| Student | Students conduct the sampling | Student | Work as a group to give names to the organisms and estimate their abundances |
| Assess | Are all students participating? | Assess | Are all students engaged in the conversation? |

11. Briefly describe how you will guide your students through the TSI Phases of Inquiry.

* Initiation – Students walking into the classroom and seeing the model environment
* Instruction – Students read (in pairs) the packet I printed from the teacher version of this activity (basically the information defining and explaining the sampling techniques) and answering the short answer questions I put on the board.
* Invention – Students look at environment to generate names for the organisms and make hypotheses about the abundance of each
* Investigation – Students conduct the 3 different sampling methods
* Interpretation – Students process their data and compare the percentages generated by their survey to what they actually see on the blanket. Students tell what sampling method they think was most accurate and why. Students tell what sampling method they would use for a novel situation and why.

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

I believe the overarching modes for this activity are **experimentation** and **product evaluation**. Experimentation because the premise of the activity is for students to explore and try out 3 different sampling techniques. This will very much be an experimental learning process for students. I believe product evaluation is a focus mode because students will be interpreting the data they collected at the conclusion of the lesson – deciding as a group which method was the most accurate in representing the relative abundances of organisms in the model environment.

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.