**Teaching Science as Inquiry (TSI) Lesson Plan #1**

**Module 4: Ecological Aquatic Science**

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Activity: Sampling Design

1. Why did you choose to do this activity?

 In ecological studies, it is important to have a way of determining what kinds of organisms are in the environment and how to actually count them. I am hoping to have my students sample a marine intertidal zone on a field study so this is a good introductory activity to prepare for that.

2. What are your classroom learning goals?

 I would like my students to be practicing authentic science as much as possible. In order to do this, they must be aware of, learn, and exercise scientific processes the way that scientists in the field do.

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

4. What date do you plan to start this activity? April 17, 2013

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

* **SC.MS.1.1** Describe how a testable hypothesis may need to be revised to guide a scientific investigation
* **SC.MS.1.2** Design and safely implement an experiment, including the appropriate use of tools and techniques to organize, analyze, and validate data
* **SC.MS.1.3** Defend and support conclusions, explanations, and arguments based on logic, scientific knowledge, and evidence from data

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

 In Sampling Design, students must use Observations and Inference in order to collect data and interpret their findings. They will be Modeling Science in two ways, first by doing what scientists do in the real world, particularly in ecological studies, and second by using M&Ms to model “organisms”. In addition they will be using Scientific Language while practicing the new vocabulary words and concepts and communicating with each other.

**Ocean**

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

 This activity will not specifically be connected to the ocean except that I will encourage the students to think about what they are doing in relation to a marine environment, specifically tide pools.

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

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

□ 6. The ocean and humans are inextricably interconnected

X 7. The ocean is largely unexplored

**Preparation**

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

 I will not prepare my students ahead of time for this activity but will be doing the optional pizza intro and going over the background information on sampling at the beginning of the first day.

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.)

 Students will probably try to access their prior knowledge of M&Ms to make hypotheses about which colors will be present in the highest and lowest amounts so I am sure there will be some strong arguments for specific ideas. They may also have some difficultly with deciding as a class how to sample the bag of M&Ms.

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)

 I think that I will primarily be using focusing and clarifying questions while the students are trying to decide how they will sample their M&Ms to help them be more specific and to stay on task.

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)

 I will focus on Science as a Discipline to help my students exhibit the demeanors of scientists as they approach a new type of activity, sampling a population. I will also as always be acting as Research Director to guide them through the process.

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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 | * Part 3: Ask students to make conclusions about the toppings on the pizza
 | Teacher | * Part 1: Walk around offering “pizza” samples
* Part 5: Introduce M&Ms sampling activity
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| Student | * Part 3: Ss think about what the whole pizza looks like and share their ideas
 | Student | * Part 1: Take pizza sample and examine
* Part 5: Ss access their prior knowledge of M&Ms
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| Assess  | * Part 3: Check that Ss are making logical inferences about the pizza from the information they have.
 | Assess  | * Part 1: Students can make a hypothesis about the toppings on the pizza based on their sample
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| **INSTRUCTION** |
| Teacher | * Part 2: Ask Ss to share what they think is on the pizza & make a list on the board
* Part 4: Reveal picture of whole pizza
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| Student | * Part 2: Share hypotheses for toppings
* Part 4: Adjust hypotheses as necessary with the new information.
 |
| Assess  | * Part 4: Students adjust their hypotheses based on new information.
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| **INVESTIGATION** | **INVENTION** |
| Teacher | * Part 6: Assist Ss as necessary while they sample the M&Ms
* Make sure Ss are following their class plan
 | Teacher |  * Part 5: Assist Ss as necessary and ask question to guide the discussion (write Ss decisions on the board)
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| Student | * Ss sample the population by group, carefully following the class plan
 | Student | * Part 5: Ss decide a class sampling scheme to determine the abundance of each color of M&M
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| Assess | * Ss should record any possible errors and make complete observations in their tables
 | Assess |  |

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).

 I will **initiate** the students to the topic of sampling by doing the optional pizza intro. Once the students have read the agenda, they will choose pieces of the pizza from a box and look at them without showing anyone else. They will be making hypotheses about the toppings on the pizza based on just their one slice, then try to **interpret** what the additional data (from classmates) means for their hypothesis, in other words, do they need to adjust it? In the **invention** phase, they will switch gears to designing a way to sample a population of M&Ms which represent marine organisms in a tide pool. They will **investigate** by carrying out their sampling scheme in their groups, then share their data through **instruction** with their classmates to then make **interpretations** about the population of M&Ms as whole.

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 overarching modes will be replication because the students will all be counting samples of M&Ms from the same bag. They will also need to use description to note how to take the samples and describe them (color). Lastly they will use induction as they will probably try to generalize from their sample to the whole M&M population.

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.

 I think this activity will be really popular with my students, but because it involves food and eating, I will have to make special arrangements to use another room because we are very strict about having food in the science classrooms. Other than that, I am looking forward to it, especially comparing between the two bags of M&Ms, one for each class.