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

**Module 3: Biological Aquatic Science**

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Activity: Processes of Inquiry – Introduction to the Modes of Inquiry

1. Why did you choose to do this activity?

 After our first activity on TSI Phases and Modes, I felt the students needed more exposure to and examples of modes to better understand how to identify them and exercise them in class. We learned both the Phases and Modes at the same time while reflecting on an activity we had previously done, so they received a lot of new information at once. I think that presenting the TSI Modes in another way would be a good way to help different types of learners understand each better through a different context. The activity that we reflected on had a heavy focus on just a few of the modes, so others such as Induction and Deduction did not really apply as directly which made it probably more difficult for the students to form a complete understanding of the practices of each mode.

2. What are your classroom learning goals?

 I would like my students to be active participants in the learning process, including using metacognition to both reflect on and to direct their learning. These are skills that are not only applicable to science, but to any time they are learning

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

 This activity will help reinforce TSI Modes of Inquiry for my students, so that they will be able to be more cognizant of what mode or modes they are using during the course of an activity.

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

 January 29, 2013

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

* **Benchmark SC.MS.1.2** Design and safely implement an experiment, including the appropriate use of tools and techniques to organize, analyze, and validate data
* **Benchmark SC.MS.1.5** Communicate the components of a scientific investigation, using appropriate techniques
* **Benchmark SC.MS.1.7** Revise, as needed, conclusions and explanations based on new evidence
* **Benchmark SC.MS.2.1** Explain how scientific advancements and emerging technology have influenced society

**Ocean**

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

 I will not explicitly connect this activity to the ocean unless the topic comes up during our discussion of the modes through examples or student questions.

7. 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

X 7. The ocean is largely unexplored

**Preparation**

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

 To prepare my students for this activity, I will bring up the prior activity that we did on TSI Phases and Modes to assess what they remember well and what they may need to have more review on. However, to keep the inquiry process intact, I will give them little explanation of each demonstration as it is presented. I am planning to follow the Lesson Plan very closely as written to see how this might work next year as a beginning of the year activity so that we can use our knowledge of the TSI Phases and Modes throughout the school year.

9. 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 format of the activity will mostly be a class discussion, which can get a little loud with this particular group of students. To keep students on task, I will require them to take notes in their notebooks as the scenarios are presented, including making predictions or writing down their ideas (rather than shouting them out) as we explore the modes with various examples.

 I expect that students will have the most difficult time understanding the difference between Induction and Deduction, so I will have several examples for each mode to try to illustrate the key differences. If there is time I will have the students try to create their own scenarios to demonstrate each mode as well.

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

 I will try to use clarifying, extending, focusing, lifting, and summarizing questions to help guide the students through the scenarios to demonstrate modes. I think that I have already been doing this, but I will try to keep track of the questions that I ask and make an effort to give students a lot of lag time in order to give them enough time to elaborate on their responses. I will also try to ask questions that focus more explicitly on the TSI Phases and Modes in order to encourage students to use metacognition more during their reflections.

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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 | * Guide students to make conclusions about the modes that they are exploring
 | Teacher | * Introduce the activity by asking students about the TSI Phases and Modes
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| Student | * Assign modes to the given scenarios and give reasons for why they are exhibiting those modes
* **Authoritative Knowledge** – Learn from the teacher or students with expert knowledge what the unknown object is
 | Student | * Try to list the TSI Phases
* Try to name the TSI Modes
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| Assess  | * Check that students are using the names of modes when discussing what they were thinking and doing
* Check that students are able to give examples of times they used the modes in other subjects or outside of school
 | Assess  | * Check for student recall of the TSI Phases and Modes
* Note the comfort level and frequency of students using the new terms (names of phases and modes)
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| **INSTRUCTION** |
| Teacher | * Present scenarios to students
* Ask students what modes they think are being demonstrated by the scenarios
* Show laminated “modes” cards and hang on whiteboard with magnets
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| Student | * Listen to scenario, take notes/make predictions
* Determine which mode is being used in each scenario
* Think of original example scenarios for each mode
* Discuss and compare ideas about modes with other students
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| Assess  | * Verbal responses by students indicate that they can identify modes
* Notes in notebook show that students could determine the modes being presented
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| **INVESTIGATION** | **INVENTION** |
| Teacher | * Use questioning strategies to guide students through exploring the scenarios
	+ What did you observe about the mystery boxes?
	+ What helped you figure out what the unknown object might be used for?
 | Teacher | * Use questioning strategies to prompt students to strategize how to determine the mode being demonstrated
	+ “Make a hypothesis”
	+ How would you study this?
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| Student | * **Curiosity / Description / Technology / Authoritative Knowledge** – Look and feel unknown object (pipettor) and make a prediction of what it is and how it is used
* **Replication** – Repeat process multiple times (predicting box contents, opening box, recording contents)
* **Description** – List or draw the characteristics of the unknown object

 | Student | * **Curiosity** – Imagine what might be in the mystery box
* **Technology** – Think of how to open the box more easily; use scissors
* **Induction**– Look for patterns in data about contents of mystery boxes to make predictions (hypotheses)
* **Experimentation** – Smell soaps and listen to teacher’s description of the tests done
* **Transitive Knowledge** – Use math to investigate the cost per ounce of the soap
* **Product Evaluation** – Determine the measures with which to evaluate the two types of soap
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| Assess | * Students are making reference to data and observations that they could make and writing down notes/drawings
 | Assess | * Students should be engaged in actively thinking about how to determine the mode being demonstrated
* Check that students are thinking of plans of action to investigate problems
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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 activity by introducing them to the TSI Modes of Inquiry through demonstrations of different scenarios, starting with the Mystery Boxes. For each scenario, I will try to pique their interest by showing them an object, explaining a situation, or posing a question for them to consider. Invention will occur as the students make hypotheses and devise ways to investigate the mystery boxes and unknown objects. For each TSI Mode, I will bring the discussion around to interpretation by asking the students questions to help them make conclusions about the modes and their usage. At the same time that they are studying the modes, they will be using various modes and I will try to help them recognize this and identify what mode(s) they are in. Throughout the activity, students will be engaged in instruction through listening to information from the teacher and each other, asking and answering questions, discussing with each other and the teacher.

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

 For this activity, the students will be learning about all of the modes, but I would like them to focus mostly Description, so that they will be able to vocalize their understanding of each mode. If they are able to describe a scenario for each mode, either the one given in class or preferably one of their own, they will have a They should be exercising Curiosity while examining each scenario to determine what it is. In order to explain why they think the scenario fits a specific mode, they will need to use Description and some Authoritative Knowledge from their previous experience learning about modes.

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.