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

**Module 4: Ecological Aquatic Science**

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Activity: Solubility from Module 2, Chemical Aquatic Science

1. Why did you choose to do this activity?

It fit perfectly with the current curriculum of the chemistry class.

2. What are your classroom learning goals?

To guide students to an intuitive understanding of the chemical process of solvation.

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

My classroom learning goals are to teach the concepts of chemistry. There is an entire chapter devoted to solubility.

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

May 9, 2013

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

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| Solutions |
| **Benchmark** [**SC.CH.5.8**](http://165.248.30.40/hcpsv3/imr/report_by_code.jsp?code=SC.CH.5.8) | Distinguish between pure substances and mixtures based on physical properties (e.g. boiling point, melting point, and density) |

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| **Topic** | Solutions |
| **Benchmark** [**SC.CH.5.9**](http://165.248.30.40/hcpsv3/imr/report_by_code.jsp?code=SC.CH.5.9) | Calculate the concentration of a solute in terms of molarity, parts per million, grams per liter, and percent composition |

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

Observations and Inference: a fundamental beauty of chemistry is that one can not directly observe the changes that occur at the molecular level, however it is easy to observe the results of those changes. By making careful observations of combining solutes and solvents, or not, and making inferences regarding the chemical nature of the substances involved is a perfect example of making inferences from observations.

**Ocean**

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

The ocean contains many substances dissolved into water, especially the salt NaCl.

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

 X 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 is chapter 14 in our textbook. They have had a year of chemistry to prepare. They were given a brief lecture on solubility, solutes, solvents and reviewed the chemical properties of matter and chemical bonds that result in solvation.

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.)

Getting the students to read the instructions before they begin! Getting the students to think for five seconds about a question before they ask it.

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)

Focusing, the majority of the students prefer to ignore the task at hand until the last second then attempt to copy answers or get angry they have to think about a problem to answer questions.

Clarifying, overwhelmingly with labs students just crank out the instructions without thinking about the reason for doing it, or the cause of what they observe.

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)

Allow modifications of procedures and hypotheses based on new information.

Provide time for: cognitive discourse, reviewing and revisiting concepts, and multiple opportunities to practice. Develop student interest, and make knowledge relevant through use of place and everyday situations, interests and life experiences, and societal or personal concerns.

Connect new information to prior knowledge.

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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 | Assisting with answering the questions from the tsi worksheets. | Teacher | Connect to Ocean Principles. Ask focusing questions about the chemical contents of seawater. |
| Student | Have students answer questions from the tsi worksheets. | Student | Think about the ocean, seawater and it's chemical contents. How did those chemicals, such as salt, come to be in seawater?  |
| Assess  | Questions from worksheets. | Assess  | Monitor attention and enthusiasm for questions. |
| **INSTRUCTION** |
| Teacher | Describe the activity to the class. Advise them what to watch for in observations.  |
| Student | Preview the handout and activity instructions. |
| Assess  | Monitor how well they follow directions.  |
| **INVESTIGATION** | **INVENTION** |
| Teacher | Monitor students performing activity. | Teacher | Ask extending questions regarding the predictions of probable outcomes. |
| Student | Students perform activity. | Student | Predictions of probable outcomes. |
| Assess | Monitor progress. | Assess | Are the answers reasonable and reflect an understanding of solvation? |

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).

Monitor the time and make sure they are on task at the appropriate step as described above. They will naturally flow from one phase to the next, to another, then return when necessary. The more they are directed the less they will naturally transition and the value of the experience will be lost.

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

Authoritative Knowledge: they will be relying on considerable chemistry knowledge acquired through months of studying.

Description: the entire activity is basically a description of what is involved in solubility.

Deduction: they will be required to deduce what occurred at the molecular level based upon what they observed.

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.