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

**Module 2: Chemical Aquatic Science**

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Activity: Properties of Water

1. Why did you choose to do this activity?

I did it because it’s a mandatory activity in Module 2. It’s also a fun activity that I know students will enjoy.

2. What are your classroom learning goals?

* Students will apply the practices and demeanors of scientists (as identified in a Module 1 activity).
* Students will be able to define “cohesion” and “adhesion” in their own words.
* Students will make hypotheses about water, using the concepts of “cohesion” and “adhesion”.

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

Because this is an inquiry activity, students will be reminded of the practices and demeanors of scientists that they identified prior to this activity, and expected to show these practices/demeanors throughout the activity. Students will read through a short article on “cohesion” and “adhesion” where they will define the terms in their own words. After each section in the activity, students will make general hypotheses about water, using the concepts of “cohesion” and “adhesion”.

4. What date do you plan to start this activity? 11/28/12

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

* Standard 1: Discover, invent, and investigate using the skills necessary to engage in the scientific process.
* 7.1.1 – Design and safely conduct a scientific investigation to answer a question or test a hypothesis.

**Ocean**

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

I’ll start the lesson by reminding students of the previous activities in the TSI module that we did as a class regarding density, and how the overall theme of why they were learning this concept was tied back to understanding the ocean. I’ll introduce this activity as another concept that we’ll be learning to help us better understand the ocean.

7. 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**

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

Students will be asked an “Initiation” question, “Is water ‘sticky’? Explain your answer.” They will also read through the short article provided by TSI on “cohesion” and “adhesion”. I developed 6 questions to guide the students’ reading and understanding of the article.

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.)

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| **INSTRUCTIONAL ISSUE** | **HOW I WILL ADDRESS IT** |
| Classroom management: students might start to play with the materials provided (pipettes, skewers, paper clips) | Prior to starting the activity, class will review the practices and demeanors of scientists, with a heavy emphasis on the demeanors. This will hopefully keep the students focused on the task at hand. |
| Students may struggle with making generalized hypotheses after each section in the activity. | If I notice the majority of students struggling with the Part A hypothesis, we will do that one together (model for the students), and they will do the remaining on their own. |

**Questioning and Assessment Strategies**

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

I created 6 questions as a guide for students while they are reading the article on “cohesion” and “adhesion”. The questions range from lower-level (recall/comprehension) to slightly higher-level (application/example).

11. What *assessment strategies* will you use to help your students meet your learning goals and monitor their progress?

* Students can share their definitions of “cohesion” and “adhesion” with their group, and each group can pick the best one, or come up with a group definition.
* On the board, I will have each team listed (by their team number). Each team will start with a plus, and as I observe the students during the activity, I’ll keep it at a plus or bring it down based on my observations on their demonstration of scientists’ practices and demeanors.
* Student hypotheses will be the main assessment of the activity, along with the follow-up questions at the end of the activity.

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| Use the following table to plan your lesson using TSI. For each phase:* **Mode(s):** List the Mode(s) of Inquiry you will incorporate
* **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

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

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| **INTERPRETATION** | **INITIATION** |
| Mode(s) | Deduction, Transitive Knowledge | Mode(s) | Curiosity, Description |
| Teacher | Assign activity questions at the end of the lab. Provide guidance to students as they are working through the questions. Answer questions from students as needed. I might also do a short follow-up to explain a little more in-depth about bonding, and why water molecules are polar. | Teacher | Present question to students to pique their curiosity and interest: Is water “sticky”? Explain your answer. |
| Student | Students will answer activity questions on a piece of paper that they will turn in for a grade. The questions will require students to analyze the results from the activity, and draw conclusions based on their observations. The questions also require students to apply their knowledge in a different setting/context. | Student | Students will be given think time first. Then they’ll discuss their answer with their partner. |
| Assess (look for) | The students’ answers will be graded as their overall assessment for this activity. The answers should be detailed, and be connected back to their observations in the activity. | Assess (look for) | Pull popsicle sticks randomly to have at least 5 students share their answers with the class. |
| **INSTRUCTION** |
| Mode(s) | Authoritative Knowledge |
| Teacher | Instruct students to read the article and answer the background information questions in their journals. Walk around class and monitor students as they read and write. Answer questions as needed. |
| Student | Students will read the article to themselves and answer the questions either while they’re reading or after they’ve read the whole article. For some students, this information will be a review, and for some it will be totally new information. |
| Assess (look for) | I’ll review the student answers to the six questions. Students will also share their personal definitions of “cohesion” and “adhesion” with their groups, and groups will share out with the class one definition of each term. |
| **INVESTIGATION** | **INVENTION** |
| Mode(s) | Curiosity, Description, Experimentation, Replication | Mode(s) | Induction, Transitive Knowledge |
| Teacher | Provide guidance to students as they work through Parts. A-D. Monitor students during the experimentation part, and observe their demonstration of scientists’ practices/demeanors. | Teacher | Provide guidance to students as they work through Parts A-D. Model examples with the class if the majority of the students don’t understand a particular part of the activity. |
| Student | Students will be testing their predictions through the TSI-developed procedures, or their own procedures they created. Students will be recording observations, drawing observations, and comparing their data/observations with others. | Student | Students will be making predictions for each section, as well as generalized hypotheses about water (in the context of “cohesion” and “adhesion”). They will also be creating procedures for certain parts of the activity to test their predictions. |
| Assess (look for) | I will be looking for students to show me good practices/demeanors of scientists. I’ll also be looking for students to make descriptive observations. | Assess (look for) | I’ll be reviewing the students’ hypotheses, specifically looking for how they explained their hypotheses using the concepts of “cohesion” and “adhesion”. |

12. Briefly describe how you will direct your students through the Phases of Inquiry.

I will do a brief discussion with them about the phases and modes of inquiry. Because I am doing this activity in conjunction with the Phases and Modes of Scientific Practice activity, I will be talking with students about how I want them to “think about their thinking” while doing the Properties of Water activity. I will stress the importance of them being aware of what they are doing at all times throughout the activity, even their thoughts and communication, not just their actions.

13. What will be the *overarching* mode(s) of this activity? Why?

* Curiosity: I know students are going to be really excited and engaged while doing this activity, because many of them are going to be shocked when they see the things that will happen!
* Experimentation: Much of this activity involves students carrying out experiments to test their predictions
* Induction: There is a big emphasis on students making predictions and hypotheses throughout each part of this activity.

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 will do Part E as a class demonstration
* I’m planning on doing this activity in conjunction with the Phases and Modes of Scientific Practice because I’m worried students will forget what steps they did if I do the activities separately.
* After Part A, I’ll do the fish tank example with students, and then have them document their own steps they took in Part A.