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

**Module 2: Chemical Aquatic Science**

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Activity: Water Properties

1. Why did you choose to do this activity?

 I chose to do this activity because my class and I are in the middle of a unit on the importance of the question “Why?” to the field of science. I am concluding the first semester with a “lab week” in which students practice examining puzzling situations with the questions “Why?” and “How?” The “Properties of Water” activity fits perfectly into the framework and genre of this week. I will complete the activity in one class period, with students engaging in the penny, ruler, and paper clip activities.

2. What are your classroom learning goals?

 Currently, we are working on a “WHY?” unit in my classroom. The learning goals are:

**I will be able to:**

* Ask the questions “Why?” and “How?” about puzzling situations
* Formulate hypotheses for the situation
* Answer the questions “Why?” and “How?” through an investigation

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

 This activity ties into the classroom learning goals because it presents a situation for which students can ask and answer the questions “Why?” and “How?”

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

 December 10th

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

 Not applicable

**Ocean**

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

 In the “hook” for the lesson, I will ask the students if they have ever asked the question “Why?” about water. I will tell them that water might be something that gets taken for granted in our everyday lives, but it is something that surrounds us (quite literally) and impacts every aspect of our daily lives.

In defining adhesion and cohesion, I will anecdotally relate the lesson to the ocean by using an example of water sticking to your body after you come out of the ocean. I will ask the students what property of water made it necessary to use a towel to dry off.

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

□ 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 prepared for this activity because it is one activity in a series of activities in which students will be following the same format to question and explain why something happens a certain way.

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.)

 I foresee students having difficulty communicating their thoughts and hypotheses about what is happening. To address this issue, I am designing a demonstration with marbles on top of a plastic container. I will put the marbles on the flat surface and release them (allowing the students to see them roll all over). Then, I will ask the students how we could get all of the marbles to stay on top of the container. I will tell them to relate this answer to what they saw take place when they put drops on a penny.

**Questioning and Assessment Strategies**

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

Students will be asked questions to answer both in a full class and a small group setting. These questions will target prior knowledge and will lead students to connecting what they know to what they are learning through this activity.

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

At the end of the lesson, students will be asked in a whole-class setting to answer “Why?” about each part of the activity. They will also be asked to apply the newly defined vocabulary terms “adhesion” and “cohesion” to the activities they have just completed.

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| **INTERPRETATION** | **INITIATION** |
| Mode(s) | Description | Mode(s) | Curiosity |
| Teacher | Will be asking questions about what happened in the experiment and leading students (through questions) to tie this to their newly acquired knowledge of adhesion and cohesion. | Teacher | Lesson is introduced as an opportunity to ask “Why?” with water |
| Student | Students apply the words cohesion and adhesion to specific examples from the previous activities. | Student | Students will be in their desks listening, answering questions, mentally engaging in the introduction to the lesson. |
| Assess (look for) | The assessment will be student answers to questions. How well can students apply the new terms “adhesion” and “cohesion” to the situations they just experienced? | Assess (look for) | Scattered throughout this “hook” will be questions probing student prior knowledge as well as their engagement in the question asking that we are doing to initiate the activity. Participation will be the assessment for student initiation. |
| **INSTRUCTION** |
| Mode(s) | Authoritative Knowledge  |
| Teacher | I present an explanation of hydrogen bonding as the reason behind what we observed. |
| Student | Students are sitting in their desks, listening to the teacher, and taking notes. |
| Assess (look for) | Students will be assessed on their ability to utilize authoritative knowledge by how engaged they are in this part of the activity. |
| **INVESTIGATION** | **INVENTION** |
| Mode(s) | Experimentation | Mode(s) | Induction |
| Teacher | Circulating the room observing the students engaging in their experiments, asking questions to prompt thinking about what is happening. | Teacher | Asking the students to answer the question “Why?” about each of the activities they have just completed. During this time, the teacher will also perform the marble demonstration.  |
| Student | Engaged in set-up and execution of the experiments collaboratively with lab group. Observation of and participation in the experiment will be large parts of this phase. | Student | Will describe their hypotheses for what happened in the activities. |
| Assess (look for) | Visual assessment based on level of engagement in the activity as well as success of experiment. | Assess (look for) | Look for quality student hypothesis that make sense in the context of the activities and that relate to the behavior of water. |

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

**Initiation**

Introduction to “Asking WHY with Water” – Students prompted to think about “why” during the activity.

**Investigation**

Students set up and conduct “Drops on a Penny”.

Students set up and conduct “Water as Glue”.

Students set up and conduct “Walking on Water”.

**Invention**

The question “Why?” is posed to students for each of the distinct situations they just experienced.

**Instruction**

Teacher conducts marble demonstration/analogy as a way to guide students to the answer. Teacher defines adhesion and cohesion.

**Interpretation**

Students apply the words cohesion and adhesion to specific examples from the previous activities.

**Instruction**

Teacher illustrates and describes hydrogen bonding as the reason for adhesion and cohesion.

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

 Overarching modes are induction and experimentation.

 Experimentation is an overarching mode because the vast majority of this lesson will be spent for student engagement in an experimental investigation of the properties of water.

 Induction is an overarching mode because the main goal of the lesson is for students to be able to take observations about the behavior of water in 3 specific situations and make generalizations about how water behaves all the time.