

Teaching Science as Inquiry (TSI) Lesson Plan

Module 1: Physical Aquatic Science

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Activity: Density Bags

Why did you choose to do this activity?

We just started our unit on density so it fits in very nicely with the sequence of lessons. It also is a great way to introduce density as it relates to the ocean because we are using water and simulated seawater which are analogous to fresh and salt water bodies of water on earth. This activity also sets up the students to be able to study and understand water layers later on in the unit.

What are your classroom learning goals?

Students should be self-directed and reflective learners as they learn the content material. They should be practicing inquiry at the same time that they learn and practice skills used by scientists. They should gain a fairly good understanding of how relative density affects water layers in the ocean.

How does this activity tie into your classroom learning goals?

The activity is structured as an investigation where students take their previous knowledge of density and apply it to a new situation, water. They first have a fairly structured activity (A) to determine the effect of salinity on density by comparing fresh and salt water. In part B, they have to identify the variables (hot and cold) themselves and set up their data table, then determine the effect of temperature on density. In part C, they combine the two factors and have to decide with their group what they want to test, make a plan, and carry it out. In doing this with successively more and more dependence on themselves than on the teacher, they are learning to take ownership of their learning. At the end of the activity they should have enough understanding of water layers and how they behave to be able to do the Water Layers activity next.

What date do you plan to start this activity?

October 23, 2012 (3 days)

If applicable: HODOE standards this lesson will address

Ocean

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

- Density differences in the ocean cause water layers to form

- Water layers created by density differences drive ocean circulation
2. 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

1. How will you prepare your students for this activity? (For example, review of prior knowledge.)
 - During the introduction to Unit 2: Density lecture, we will discuss the factors that affect density and remind ourselves of the formula for density, $\text{Density} = \text{mass}/\text{volume}$.
 - I will ask students to give examples of things that are dense and not dense
 - We will discuss how to make simulated seawater (by adding salt to water).
2. 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.)
 - Classroom management of this activity can be difficult due to the number of things going on concurrently and the use of water and hot plates. – I will make sure that the students do not need to move around the room very much, that they are set up at their stations, and do their preparation (predictions) before they come to class.
 - Students may think that if the water is hot or fresh it is always less dense or that if it is cold or seawater that it is always more dense and forget that the combination of factors may cancel each other out. – After doing the activity, we will collect class data and compare on the board. After doing the Activity Questions for homework, we will have a discussion in class.
3. Select the TSI Mode(s) of Inquiry that you will focus on for this activity. (check all that apply)
 - Curiosity
 - Description
 - Authoritative knowledge
 - Experimentation
 - Product evaluation
 - Technology
 - Replication
 - Induction

X Deduction
X Transitive Knowledge

Questioning and Assessment Strategies

1. What *questioning strategies* will you use to help your students meet your learning goals?
 - I will ask students:
 - to think of examples of things that are “dense” and “not dense”
 - to draw pictures of the sinking, floating, and subsurface floating bags to illustrate their observations
 - to decide what combinations of warm or cold, and seawater or fresh water they want to test, to help them learn to set up an experiment with different variables

2. What *assessment strategies* will you use to help your students meet your learning goals and monitor their progress?
 - Completion of pre-lab procedures sketches and predictions
 - Data and observations recorded during the activity
 - Notes taken during class discussion of data and Activity Questions

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 have taught this lesson once before, last year, but at that time did not implement the entire activity, only Part C. I am hoping that this year, the students will have a more thorough understanding of the effects of salinity and temperature separately affect water density so that when they put the two together, they will be able to weigh both factors in making their predictions. I am also giving the students more control over preparing the lab materials and in choosing the combinations to test.