Saltwater and Freshwater: Is There a Difference?

Saltwater and freshwater are found in different places on the earth. Many different things live in these different places. In this investigation, you will be asked to find out what the difference is between saltwater and freshwater, using your 5 senses.

You have 2 containers of water, 1 with saltwater and 1 with freshwater. Set up a way to record whether there is a difference between the water in the 2 containers by:

- How the water looks?
- How the water smells?
- How the water sounds?
- How the water feels?
- How the water tastes?

Conduct one more ADDITIONAL test on the 2 containers on your own. Record your results and try to make a conclusion about these 2 kinds of water that are found on earth.
Saltwater and Freshwater: Is There a Difference?

Suggested Grade Span

3–5

Task

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Big Ideas and Unifying Concepts

Cause and effect
Systems

Physical Science Concept

Properties of matter

Mathematics Concepts

Comparison of attributes or effects
Data collection, organization and analysis
Graphs, tables and representations
Measurement

Time Required for the Task

Approximately 30 minutes (including introducing and laying the ground rules).
Context

This is one of several science investigation stations that I set up in my classroom during a mini-science circus. The students were exposed to the scientific method earlier in the year and continued to practice their skills practice through independent work in these stations. The students did not have any prior work with me on the topic of water, although many had done sink-and-float activities in the past. The focus was not so much on learning about concepts of water as on the scientific skills of observing and drawing conclusions, using the five senses, to create a theory that would distinguish similarities and differences between saltwater and freshwater. Their findings and observations gave me a starting point for more direct instruction to follow on the topic of water habitats; therefore, this can be considered a preliminary inquiry assessment task to guide further planning for instruction.

What the Task Accomplishes

This investigation task is a good introduction to applying some aspects of the scientific method and scientific inquiry. It allows the teacher to assess scientific literacy – the knowledge and skills related to scientific exploration students have already acquired. The aspects of the scientific method that are included in this activity are making observations using all of the senses, designing an investigation based on a hypothesis, collecting and recording data, and analyzing data to draw conclusions. (This was challenging for many of my students.) Some students might also use their observations to challenge misconceptions and to raise new questions.

How the Student Will Investigate

Many students worked with a partner in these stations, but it is not required for this task. The students used the directions on the lab worksheet to guide observations. The students began by looking at the two bowls of water and many quickly took guesses (based on prior knowledge) about which had the salt in it. Most students set up charts on their own to record data, but some tried to fit entire sentences into this format. When it came for them to create their own test, many did a sink and float test, but others tried to use thermometers to look at temperature – another aspect that had not yet been recorded.

Interdisciplinary Links and Extensions

Science
I would not end the inquiry here; many more investigations with water are possible. A trip to a local pet store might help students to explore the differences in fish that live in freshwater or saltwater, as well as differences in water temperatures and in plants that might thrive in these habitats. If possible, field studies in a local habitat would be ideal to reinforce concepts learned in the classroom. Saltwater and freshwater aquariums would provide long-term opportunities for study. Students could explore any differences in boiling and freezing points of these samples. (See also "Salt on the Roads," Exemplars task for grades 6-8.)
Social Studies
Students could locate and map regions of the world where freshwater and saltwater habitats are found. They might also look at how communities along seacoast regions have made use of desalination techniques to turn saltwater into freshwater.

Mathematics
Students could try measuring temperatures of water throughout the day – this skill was found to be quite weak in this inquiry and needs to be reinforced with guidance in reading and recording actual temperatures. Findings could be used to create a graph or chart. Volume and liquid measuring could be another mathematical extension. Problem-solving tasks related to the number of fish that can survive in a particular size fish tank can be interesting challenges and connect to the science concept of "carrying capacity".

Teaching Tips and Guiding Questions
Whenever taste is used, it is ESSENTIAL to stress to students that they should never use this sense unless they are certain that the material being studied is edible and safe. I try to have plenty of containers (and a few pitchers) ready so that all can get started quickly on their inquiry.

Some guiding questions could include:

- In what ways are you now aware of the differences between Saltwater and freshwater? Can you try to find some more?
- Why do you think only certain animals and plants can live in each type of water?
- If you could not use taste, what would be three senses that you could use to help you tell the difference between salty and fresh?
- What would happen differently if we tried to freeze each of these? or boil them?
- What are your conclusions? Can you support your conclusions (give examples) using your data/observations?
- What do you think you have learned about water? What do you still wonder about?

Concepts to be Assessed
(Unifying concepts/big ideas and science concepts to be assessed using the Science Exemplars Rubric under the criterion: Scientific Concepts and Related Content)

Physical Science – Properties of Matter: Students observe similarities and differences in the physical properties of and behavior of freshwater and saltwater. By observing characteristics of different water samples, students begin to understand the implications for freshwater and saltwater habitats and ecosystems.

Mathematics: Students use precise measurements and apply the concepts of compare and contrast. Students collect, organize and analyze data and use graphs, tables and representations appropriately.
Skills to be Developed

(Science process skills to be assessed using the Science Exemplars Rubric under the criteria: Scientific Procedures and Reasoning Strategies, and Scientific Communication Using Data)

Scientific Method: Observing (using all senses), collecting and recording data, drawing conclusions, communicating findings, challenging misconceptions and raising new questions.

Other Science Standards and Concepts Addressed

Scientific Method: Students describe, predict, investigate and explain phenomena.

Scientific Theory: Students look for evidence that explains why things happen and modify explanations when new observations are made.

Physical Science – Properties of Matter: Students observe and describe similarities and differences in physical properties of water samples.

Suggested Materials

This inquiry task, to be carried out successfully, requires little advanced preparation and minimal materials. I provided:

- Salt
- Bowls
- Pitchers
- Water
- Magnifying glasses (hand lenses)
- Thermometers
- Measuring devices

Possible Solutions

Solutions vary but should follow logically from the senses that were used to gather the data. The focus of the assessment is to determine whether clear observations are recorded and organized in a meaningful way (i.e., using a chart). Use of scientific tools should be evident, if appropriate, and teachers should rove about the room noting how skilled students are in using tools appropriately as they work.

Task-Specific Assessment Notes

Novice
The student has little understanding of the inquiry process and does not complete the investigation. Although s/he does get started, s/he is not able to conduct the tests required to
make comparisons between the two types of water. His/her work is not labeled, and there is little if any evidence of science process skills at work.

**Apprentice**
The student’s work shows that s/he understands the investigation enough to carry it out. His/her data are clear and complete, but s/he uses sentences rather than key words and phrases – a better way to represent and organize scientific data. The additional test is the same as the touching test in part I. This is evidence that the student is able to follow a predetermined plan but has difficulty extending thinking to create a new and related test. The conclusion is not linked to work done in this investigation but rather to prior knowledge about water.

**Practitioner**
The student completes the observations and labels them correctly so that the reader can understand his/her thinking. The student’s work is represented in a table that has phrases and sentences (though this could be organized more clearly – see Expert sample). The additional test goes beyond the ones already conducted. (For example, I observed the student using the thermometer to test his/her question and that s/he had a good sense of how to use the thermometer in measuring, but, s/he did not give actual readings in the data recorded. The student’s conclusion begins to move beyond the obvious observations about temperature, as s/he attempts to connect temperature to some prior knowledge about the chemical nature of salt.

**Expert**
The student provides a detailed table of results for the data. S/he was able to use some key words that make the information clear. S/he has included a heading for the table, adding clarity. The student designs a further test using temperature but fails to record the actual temperatures in the data. The student states that one sample is warmer than the other, and his/her conclusions make connections to the real-world application of using salt to melt ice in winter. This is good evidence of conceptual understanding about the chemical properties of salt.
Salty water and fresh water are found in two different places on the earth. Many different things live in these two different places. In this investigation you will be asked to find out what is the difference between salty and fresh water, using your 5 senses.

You have two containers of water, one salty and one fresh.

Set up a way to record whether there is a difference between the two containers by:

- How do they look?
- How do they smell?
- How do they sound?
- How do they feel?
- How do they taste?

\[ \text{Different} \]
\[ \text{The same} \]
\[ \text{They don't make sound} \]

Same data are recorded but are vague or not useful (both felt wet).

Conduct one more test on the two containers of your own. Record your results and try to make a conclusion about these two kinds of water that are found on earth.

The student did not complete the investigation.

The student was unable to conduct the first set of simple tests using senses.
Salty water and fresh water are found in two different places on the earth. Many different things live in these two different places. In this investigation you will be asked to find out what is the difference between salty and fresh water, using your 5 senses.

You have two containers of water, one salty and one fresh.

Set up a way to record whether there is a difference between the two containers by:

How do they look? The salty one is blurry and the fresh one is clear.
How do they smell? The salty one smells like salt and the fresh one doesn’t smell like anything.
How do they sound? They don’t sound like anything.
How do they feel? The salty one feels like water and the fresh one feels like water. It tastes like the ocean.

Conduct one more test on the two containers of your own.
Record your results and try to make a conclusion about these two kinds of water that are found on earth.

The salt water is found in the ocean and the fresh water is in the lakes.

The “further” test is the same as a test in part one. Thinking has not extended.
Salty water and fresh water are found in two different places on the earth. Many different things live in these two different places. In this investigation you will be asked to find out what is the difference between salty and fresh water, using your 5 senses.

You have two containers of water, one salty and one fresh.

Set up a way to record whether there is a difference between the two containers by:

- **How do they look?**
  - The **salty water** is foamy and the **fresh water** is clear.
- **How do they smell?**
  - The **fresh water** smells more like regular water.
  - They **don’t have a sound**
- **How do they sound?**
  - The **salty water** feels thicker.
  - The **salty water** tastes very salty.

**Conduct one more test on the two containers of your own.**
Record your results and try to make a conclusion about these two kinds of water that are found on earth.

**The student tests an additional physical property and uses appropriate tools to collect data.**

- **What is their temperature?**
  - The **salt water** is warmer.
  - I think the **salt water** was warmer because the salt might have a chemical in it.

**Conclusions go beyond the obvious data in an attempt to explore the chemical nature of salt.**
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You have two containers of water, one salty and one fresh.

Set up a way to record whether there is a difference between the two containers by:

<table>
<thead>
<tr>
<th>How do they look?</th>
<th>Salty</th>
<th>Fresh</th>
</tr>
</thead>
<tbody>
<tr>
<td>How do they smell?</td>
<td>Misty</td>
<td>Clear</td>
</tr>
<tr>
<td>How do they sound?</td>
<td>No sound</td>
<td>No sound</td>
</tr>
<tr>
<td>How do they feel?</td>
<td>Grainy</td>
<td>Smooth</td>
</tr>
<tr>
<td>How do they taste?</td>
<td>Salty</td>
<td>Tastes like tap water</td>
</tr>
</tbody>
</table>

Salt water has some characteristics that fresh water isn't at all like. Salt water has the same characteristics as salt, and fresh water isn't at all salt.

Conclusions are based on data.

Conduct one more test on the two containers of your own. Record your results and try to make a conclusion about these two kinds of water that are found on earth.

Final conclusions make connections between the chemical properties of salt and real world applications.

How salt water and fresh water are different in temperature.

Why?

Salty = hot

Cold = salt melts ice into water in winter, so maybe it warms water up.