TRB 5:1 - Activity 3: Melting and Freezing

Summary

After completing this activity students will discover that the weight of ice / water will not change after it undergoes melting or freezing.

Materials

For each group:

- access to a scale
- 1 plastic locking storage bag
- access to a freezer
- measuring cup
- permanent marker

Background for Teachers

Your students may know that ice will float on water, but they may not know that a volume of water has the same weight whether it is frozen or liquid.

Intended Learning Outcomes

1-Use science process and thinking skills.
2-Manifest scientific attitudes and interests.
3-Understand science concepts and principles.
4-Communicate effectively using science language and reasoning.

Instructional Procedures

Invitation to Learn:
This demonstration will help to grab your students' attention and introduce the activity. To prepare, fill a plastic locking bag with ice cubes (leave it in a freezer until you are ready to do the demonstration). Fill another plastic locking bag mostly full of water and zip it closed.
Begin by showing the class the two bags and asking them to predict what will happen when you stick a sharp pencil into each of the bags. Stick the pencil into the bag of ice. Ask: "Why didn't anything leak out?" Next hold the bag of water over a large bowl or bucket and quickly stick the pencil through both sides. No water should leak out. (You should practice this before class.) Ask the class to explain why the water didn't leak out. (The plastic shrank together and sealed the hole around the pencil.)
Make a T-chart or Venn Diagram on the board and have the students list the properties of the ice on one side and the water on the other side. Remind students that weight is a property of matter. Ask: "If I took a bag of water and froze it, would it weigh more before it was frozen of after it was frozen?"
Listen to their answers and explain that today they are going to do an experiment to discover the correct answer to that question.
Instructional Procedures:
Cooperative teams of 3-5 should complete the following procedures: (see "Team Procedures")

- Using a permanent marker, label a plastic locking bag with your team identification.
- Measure 250 ml of water using a measuring cup. Pour the water into the plastic locking bag and seal the bag.
- Make an estimate of the combined weight of the bag and the water. Record your estimate.
- Weigh the bag and the water and record the weight. Compare actual weight and estimated weight.
- Place the bag of water in a freezer.

Record a prediction of what you think the weight of the water and bag will be after the water has frozen.
Weigh the bag after the water is completely frozen. Record the weight and compare the frozen weight with the liquid weight.
Write a statement that explains the relationship of the weight of water and ice.
Predict what the weight of the water will be when it melts. Let the water melt and check your prediction.

After students have completed the activity allow them to share what they have learned. Discuss the statement: The weight of a specified quantity of water (liquid) is equal to the weight of the same quantity of ice (solid). Is this statement always true? Is freezing a physical change or a chemical reaction? Why? (No new substance is created; the water just goes through a physical change.) Is this statement true for all forms of matter? How would you test other types of matter?
You may wish to allow students to investigate other types of matter. (See Possible Extensions.)

Extensions

After students have discovered that a specified quantity of water has the same weight, whether frozen or solid, challenge the teams to design an experiment to learn if the same is true for other types of matter. Have the students think of common things that melt and freeze at temperatures that can safely be attained in the classroom. (Many items can be safely melted in the classroom by placing them in a Mason Jar then placing the jar in a pan of water and heating the water on a hot plate. Or, try placing the items on aluminum foil under an adjustable desk lamp.) These items might include chocolate, butter, ice cream, wax, cooking oil, or shortening.
Have each team select a different substance to test and write step-by-step procedures for conducting the experiment. Allow teams to share their data after completing the experiment. Work with each team to ensure that safety concerns are addressed while melting and freezing the substances, and that neat and accurate data is collected.

Assessment Plan

Use this rubric to assess your students ' performances:
Student 's Name_____

	4	3	2	1
Journal Page	Descriptions and data clear and accurate. All observations completed.	Descriptions and data mostly clear and accurate. All observations completed.	Descriptions and data somewhat clear and accurate. All obervations incomplete.	Descriptions and data unclear and inaccurate. All observations incomplete.
Participation in Activity	Used time well and focused attention on the activity.	Used time fairly well. Stayed focused on the activity most of the time.	Did the activity but did not appear very interested. Focus was lost on several occasions.	Participation was minimal OR student seemed negative about participating.

Bibliography

This lesson is part of the Fifth Grade Science Teacher Resource Book (TRB3) http://www.usoe.org/curr/science/core/5th/TRB5/. The TRB3 is designed to be your textbook in teaching science curriculum to your students. This book covers all the objectives of each standard and benchmark. If taught efficiently, a student should do well on the End-of-Level (CRT) tests. The TRB3 is designed for teachers who know very little about science, as well as for teachers who have a broad understanding of science.

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