

4th Grade Matter Unit

Unit Overview

The Matter unit, taught using BSCS T.R.A.C.S. *Investigating Changing Properties* and *Investigating Heat and Changes in Materials*, provides students an opportunity to study many different objects and their properties. By investigating the properties of different materials, students realize that the properties of those materials are a reliable means to identify specific materials and distinguish them from other materials. Students start the unit by investigating and collecting data on the properties of five familiar (common, ordinary) white powders: salt, cornstarch, baking soda, alum, and talcum powder. Students observe the dry powders and gather as much data as possible. Then, students conduct additional tests with other substances, such as water, vinegar, red cabbage juice, and iodine to discover properties that they cannot observe without manipulating the powders in some way. Students record descriptions of the reactions, adding to their base of information and increasing the likelihood of correctly identifying a “Mystery Powder” in a later activity. In the second half of the unit, students study heat and changes in states of matter. They observe and describe water in its three states and measure its temperature as it changes from one state to another. Students learn that heat moves in predictable ways, constantly flowing from warmer objects to cooler objects. (*Investigating Changing Properties*, pp. 8-9 and *Investigating Heat and Changes in Materials*, p. 8)

Throughout the unit students describe and record data in student-constructed data tables. They learn that keeping track of data in tables makes the data easier to read and interpret. Students are encouraged to act like scientists, applying what they have learned to answer questions and formulate new ones. (*Investigating Changing Properties*, p. 9)

Essential Questions:

1. What are properties of objects? How can properties be used to distinguish one material from another? How can the properties of an object be changed?
2. What are good scientific practices?

Unit Questions:

1. How can mixing two or more materials affect their properties? Why is this important?
2. How do heating and cooling affect materials?
3. What happens when warmer objects are placed near cooler objects?
4. Why do the results of similar experiments rarely turn out exactly the same?
5. What is a “fair” experiment? Why should “experiments” be fair?

Lesson Summary (Pages 13-15 in BSCS T.R.A.C.S. *Investigating Changing Properties* and pages 13-16 in *Investigating Heat and Changes in Materials*)

Investigating Changing Properties Module

Lesson 1 (Which Is Which?): Students describe an object missing from their classroom by listing its properties. Then, teams use the properties of salt and cornstarch to help distinguish the two similar powders.

Lesson 2 (Exploring Five White Powders): Students explore how the five white powders react when mixed with water. Teams conduct an investigation in which they mix a sample of each substance with water and observe and record the results. Students make data tables to collect the data from this and subsequent investigations.

Lesson 3 (Investigating With Other Liquids): Teams conduct an investigation in which they mix each of the five powders, separately, with vinegar, red cabbage juice, and iodine. Teams observe and record the reactions.

Lesson 4 (The Mystery Mixture): Teams receive a mixture of two of the powders they have been investigating. They plan an investigation, using supplies from the previous lesson, to determine which powders are in the mixture. Teams compare the reactions of the mixtures to the data in their data tables and identify the powders by matching the reactions.

Lesson 5 (Does It Disappear?): Students observe a demonstration in which a drink mix powder is dissolved and discuss the powder's tendency to dissolve as a property of the powder. Then, teams consider whether or not the dissolved powder is still present in the drink mixture and conduct an investigation in which they evaporate the water from salt/water and alum/water mixtures to find out if the powders are still present.

Lesson 6: Skip

Lesson 7 (The Secret Mixture): Each team makes a mixture of two or three powders and writes the names of the powders in their science journals. Teams plan investigations for identifying the powders, exchange mixtures, and identify powders in the other team's mixture.

Investigating Heat and Changes in Materials Module

Lesson 1 (What Does Heating Do?): Students construct a data table and record their ideas about changes caused by heat sources. Students predict and then observe what happens to familiar objects when they are heated with a blow dryer. They create a data table, record their findings, and compare the objects before, during, and after heating.

Lesson 2 (What Does Cooling Do?): Students investigate what happens to the objects from Lesson 1 when the objects are placed in a refrigerator and in a freezer overnight. They create a new data table, make predictions, record their findings, and compare the objects before and after

cooling and again at room temperature. They compare what happened to the objects as a result of heating and cooling.

Lesson 3 (How Hot Is It?): Students review how to read thermometers and demonstrate their skill by measuring and comparing water at different temperatures. They discuss how using a thermometer helps them know exactly how hot or how cold something is. The lesson ends with a performance assessment of students' ability to read the Celsius scale of a thermometer accurately.

Lesson 4 (Where Does Heat Flow?): Students investigate the process of heat transfer between two samples of water. They construct data tables and record data for 10 minutes as the temperature of the water changes. Then, students individually graph their data and describe what took place. The students identify the heat source, the direction of heat flow, and the variables that affect the heat transfer.

Lesson 5 (It's Melting!): Students work in teams to find the melting point of ice. They make a graph of their data and use it to help them explain what happened as the ice melted. They discuss the heat transfer involved in the change of state of ice from solid to liquid.

Lesson 6 (It's Freezing!): Teams build a mini-freezer and find the freezing point of water. Students use their data to construct a graph that displays the temperature change as water freezes. They describe the heat transfer involved in the change of state from liquid to solid and compare the freezing point of water with the melting point of ice.

Lessons 7 & 8: Skip

Lesson 9 (What Have You Learned?): In this lesson, students complete tasks through which they demonstrate what they have learned about the major concepts of the module.