Liquid Exploration

Summary

Students observe the differences between solids, liquids and gases. They sort different liquids as to their physical properties. Finally, they observe how food coloring mixes in water, club soda, and salt water.

Time Frame

1 class periods of 60 minutes each

Group Size

Small Groups

Materials

- Diagram PDF
- Food Coloring Drawings

  Fill about 25 clear small plastic or glass jars with different liquids. Look for liquids in your kitchen, bathroom, etc. Make sure you have several different colors, different viscosities, and some liquids should be opaque. Tape a number on each jar, which identifies the liquids on a separate piece of paper. Group the jars into 5 groups of 5. This will give you enough jars for 5 groups of students. Within the 5 jars for each group, have as much variety in the liquids as possible.
  clear plastic cups
  any color of food coloring
  club soda
  salt

Background for Teachers

Matter comes in three forms: solid, liquid and gas. Solids maintain their own shape. Liquids flow and take the shape of their container. Gases are mostly empty space and will diffuse to take the shape of their surroundings. The diagram attached illustrates the amount of empty space in the three states of matter .
Liquids can be sorted based on their physical properties. Liquids can differ in color, viscosity or thickness, how clear they are, and other qualities.
Plain and salt water have different densities. Food coloring will sink in plain water because it is denser but will float on salt water because it is less dense. In club soda, food coloring will diffuse quickly because the carbonation bubbles help mix the food coloring. Overtime, the food coloring will diffuse throughout all three of the water-based solutions.

Intended Learning Outcomes

Framing questions. Designing investigations. Conducting investigations. Collecting data. Drawing conclusions.
Developing social interaction skills with peers. Sharing ideas with peers. Connecting ideas with reasons. Using multiple methods of communicating reasons/evidence.
Ideas are supported by reasons. Communication of ideas in science is important for helping to check the reasons for ideas.

Instructional Procedures

Pre-lab Discussion:
Show the students the diagram above. Using water for the example: use ice as the solid, a cup of water for the liquid, and have water boiling to show steam as the gas. Discuss how all three substances are 'water' and that they only differ as to what form they are in.
Instructional Procedure:
I. Students will classify a group of liquids by observing their physical appearance.

Have the students observe the liquids in the jars on their table. Discuss how they are the same and how they are different. Help guide them with questions such as color, thickness, see through or not see through, ability to bubble, and any other quality you can distinguish.
Have students take turns classifying the jars into groups according to their similarities and differences. Accept (just about) ANY classification scheme from the students. Students don't need to use all the jars each time they classify them. Repeat this for as many different classification schemes as they can.
Exchange jars with another group. You can exchange up to 5 times since you have 5 different sets of jars. However, students usually have mastered the concept after about 3-4 exchanges.
When the students have classified several groups of jars, have one table classify the jars into groups and see if another table can figure out how they classified them.
When students are done, see if they can come up with a quality that all liquids have in common. Move them towards the definition of a liquid that all the bottles are filled with something that flows.
If they haven't already, let them guess what liquids are in each of the jars on their desk. This can be checked with the answer sheet.

II. Students will watch how a drop of food coloring moves differently in plain water, salt water and club soda.

Have students fill two of their three plastic cups 2/3 full with water. Leave one with plain water and add 3 spoonfuls of salt to the second cup. Have the students stir the salt water and observe how the mixture changes over time. Keep the third cup empty for the time being. Place these cups on a plain white piece of paper.
Have the students predict what they think will happen when a drop of food coloring is added to each of the liquids.
Place a drop of food coloring into the plain water. Have the students immediately observe what is happening. The drop of food coloring should slowly sink to the bottom of the cup. Overtime the color will diffuse and spread out through the water in the cup. They should observe for one minute.
Add a drop of the same color food coloring to the cup with the salt water. Discuss how the color drop appears to be different when added to the salt water. The salt water will be dense and the drop of food coloring will float and form a layer on top of the salt water. Observe for one minute.
Fill the third cup with club soda. Add a drop of the same color food coloring to the club soda and repeat your observations and discussions. In the club soda, the drop of food coloring will quickly spread throughout the liquid. The bubbles in the soda serve to mix the food coloring throughout the liquid.
Discuss how these three liquids look similar but behave very differently. Let the cups sit for 15 minutes and compare them again.

Bibliography

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