2nd Grade - Lesson 2.1
Liquids have Properties
Teacher Background

In science lessons, students often observe, categorize, and test a variety of solid objects or substances to discover their properties. Students have fewer opportunities to closely observe liquids and to understand that liquids also have characteristic properties.

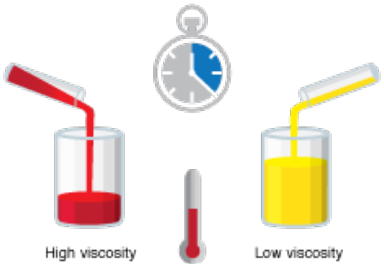
In Lesson 2.1, students compare water, mineral oil, and corn syrup, which are all clear colorless liquids. The liquids look very similar but show different characteristics when tested.

Moving at the Molecular Level

When the liquids are tested on the tilted plastic bag, their different speeds result mainly from a combination of two factors. One is the degree to which the liquids stick to the plastic and the other is the viscosity of the liquids.

The term "viscosity" is not used in the lesson but the concepts covered in the "EXPLAIN" part of the lesson address the phenomenon of viscosity. Viscosity is the resistance to flow that a liquid experiences when its molecules move past one another. This has a lot to do with the size and shape of the molecules.

One way to compare the viscosity of two liquids is to start with the same amount of each liquid at the same temperature and pour them from identical containers at the same angle for the same length of time. The one that pours the slowest has the higher viscosity.

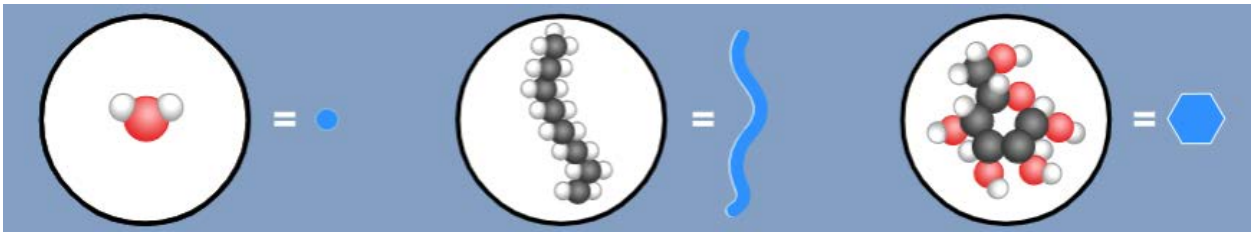


Testing Viscosity

Another factor in the test students do is that all the liquids have a very thin layer of molecules in contact with the plastic and may or may not stick to it. Water is the least sticky and also has a very low viscosity so it moves the fastest. Oil sticks a bit to the plastic but also has an intermediate viscosity so it flows slower than water. Corn syrup sticks the most to the plastic but also has the highest viscosity so it moves the slowest.

Molecular Models

The "EXPLAIN" part of the lesson uses two different types of molecular models. One type of model shows the atoms and how they are arranged and connected to one another to form the molecule. The other type of model uses a simplified shape to represent the molecule. For both models, remind students that atoms and molecules are very tiny and can't be seen. The models help us understand why the water, oil, and corn syrup act the way they do.



Water **Oil** **Glucose (Corn syrup)**

The Food Coloring Test

In the "EXTEND" part of the lesson, the food coloring drop spreads out in the water, stays together and sinks in the oil, and spreads out on the surface of the corn syrup. Food coloring is mostly water and mixes readily in the water. The food coloring is more dense than the oil so it sinks in the oil. Also, the oil is non-polar so the polar food coloring does not mix well with the oil. The food coloring is less dense than the corn syrup so it stays on top. It is also attracted to the polar glucose molecules in the corn syrup and spreads out on the surface.

These explanations based on polarity and density are not intended for students. The main idea for students is that different liquids are made from different molecules, and therefore behave differently.