JSD 3D Learning Activity Template

Grade: 6th	**Title:** Matter on the move. Do heating and cooling have an effect on matter?

Utah Science with Engineering Education Standard (SEEd): 6.2.2 Develop a model to predict the effect of heat energy on states of matter and density. Emphasize the arrangement of particles in states of matter (solid, liquid, or gas) and during phase changes (melting, freezing, condensing, and evaporating).

Key crosscutting concept(s) (CCC): 1) Cause and effect: mechanism and explanation 2) Energy and matter: flows, cycles, and conservation

Key science and engineering practice(s) (SEP): Developing and using models

Materials:

- Hot tap water
- Cold water
- Blue food coloring
- Yellow food coloring
- 3 Wide clear plastic cups
- 2 Tall clear plastic cups
- 1 Wide clear plastic cup
- Plastic bottle, ½ pint or ½ liter
- goggles

Time: about 30 minutes; 10 minutes per activity and 10 to discuss

Teacher background, key content information and hints:

Prior knowledge that students need: 4th grade water cycle unit and 5th grade matter unit.

Learning Activity Plan

These three aspects of a lesson should be identified in your learning activity.

Gathering: *(Obtain Information, Ask Questions/Define Problems, Plan & Carry Out Investigations, Use Models to Gather Data and Information, Use Mathematics/Computational Thinking.)*	***Reasoning:*** *(Evaluate Information, Analyze Data, Use Mathematics/Computational Thinking, Construct Explanations/Solve Problems, Develop Arguments from Evidence, Use Models to Predict & Develop Evidence.)*	***Communicating:*** *(Communicate Information, Argue from Evidence (written & oral), Use Models to Communicate).*

Phenomenon: It is warmer at the ceiling that at the floor of a room.

Learning Activity: **S**tudents will be introduced to the idea that heating and cooling have an effect on matter. They will see that food coloring mixes significantly faster in hot water than in cold water and begin to develop the idea that adding heat energy increases the movement of water molecules. Students will also do an activity where they heat and cool the air inside a bottle that is covered with a film of bubble solution. These demonstrations and activities will help students develop a foundation for why substances change from one state to another.

Assessment of student learning:

- Records observations with words and drawings
- Explains observations in terms of molecular motion
- Makes a prediction based on observations during the demonstration
- Follows given procedure
- Correlates temperature with the relative speed of molecules

Name _____

Movement of food coloring in cold water and hot water

Procedure:

1. Add hot tap water and cold water to two separate clear plastic cups until they are about 3/4 full.
2. With the help of a student volunteer, add 1 drop of blue and 1 drop of yellow food coloring to each cup at the same time.
3. Do not stir, but watch the colors as they move and mix on their own.
4. Draw a model of what you see and explain what happened.
5. Did one mix faster than the other? Why?

Heating also affects a gas.

Procedure

1. Add hot tap water to a wide cup until it is about 1/3 full. Make sure students realize you are using hot water.
2. Use your finger and a little water to moisten the rim of the bottle and the top surface of the lid. Then, place the lid upside down on the bottle so that there are no leaks.
3. Carefully push the bottle down into the hot water.
4. Draw a model and explain what happened.
