Strand: **8.1**	Standard: **8.1.5**	Episode 5	**Big Idea**: Heat energy changes the state of a substance.

Title: "Phase Changes with H_2O"	**Time**: 45-50 minutes	CCCs: Cause and effect	Practices: **Developing and using models** **Using mathematics and computational thinking**

Narrative of episode: This lab is meant to help students clearly observe that when matter changes phases, it is due to changes in thermal energy. Make sure for this experiment that you use large beakers. It calls for using 400 mL beakers in the packet. It also works well with 600mL beakers if you have those.

Gather:
Before you get started with the lab, discuss with the students what the purpose of the lab is. Talk to them about the variables that they are going to put on their graph. What is the independent variable? (The variable we have decided to change or test). What is the dependent variable? (The variable we are going to measure). I find it is helpful to help them label their graph first so that they know what they are looking for in their **computational thinking.** Help them to come up with a title for their graph that is interesting but clearly titles what the graph is showing. Make sure they label the x and y axis with titles that are clear and give details. I like to tell my students that a graph is a story summary. You should be able to know the story of what happened by studying a graph.

Put a small amount of water in the bottom of the beaker and have them take their first temperature before they put the beaker on the hot plate. Make sure that their hot plates are only on medium. The students need to keep a timer running so that they can record their temperature every minute. They need to put their thermometers in the liquid about 15 seconds before the minute and stir mildly. There are several things they need to note specifically in their observations:
*when all ice is melted
*when visual distortions form in the water due to thermal currents and density changes
*when steam first appears
*when the bubbles start
*when the bubbles form from the center of the water.
Tell them that you want detailed observations so that they are focusing on what differences the heat is making. They can list what percent of the ice is melted for instance. Make sure they continue to keep their data for a good three minutes after a full boil is reached with the water.
After they have completed this time, they need to create a line graph with their data. Explain to them that this graph is a **model** of H_2O and its state changes.
Reason:
Have them go through the labeling of the information requested in the directions on their graph.
As a whole group, have a discussion with the class about the patterns of their data.I find this is an effective way for students to use **computational thinking.** Have them start general and then get more specific. They may originally say that over time the temperature kept rising. Have students record these patterns on their paper as the discussion goes. Some may point out the flatter lines on the graph. When they do, discuss when this occurred.
Communicate:
Have them communicate as a group about this and come to a conclusion. Then have each group communicate their ideas to the class.After the discussion, Have them label what was happening here on their

graph.What are the names of the phase changes? Have the groups analyze their patterns of their graphs and use their **computational thinking** skills to make a claim about phase changes that the data supports.

Assessment: You will have summative assessments along the way as you go around and ask the students about their observations. I especially like to focus on the observations of visual distortions to get students input on that. The more in-depth assessment will be the questions at the end of the lab	**Materials, resources, handouts, etc:** 400 mL beakers for each group filled with ice A thermometer for each group A hot plate for each group Their lab packet for this lab Timers A5 - Instruction Sheet for Phases of H2O A5 - Phases of H2O Packet.docx