

Learning Cycle Lesson Planning Form		
Science Topic/Content Area:	Grade Level:	Science Standards to be Addressed:
Properties and Uses of Water	4	SC.4.P.82- Identify properties and common uses of water in each of its states.
1. What concepts/big ideas do you intend students to learn?	<p>Science concept(s): Water can be found in 3 different states. As a solid it is called ice and you can find it with snow, sleet, hail, and on an ice rink when you go ice-skating. As a liquid it is called water and has many uses, which can be for drinking, bathing, to cook, clean and hundreds of other things. As a gas it is called water vapor. You see it when you are cooking and see the steam rising. You can also find it coming from steam engine trains.</p> <p>Idea(s) about the nature of science: The world is understandable. So, how the states of water contribute to the understanding of other processes and occurrences in the world like acid rain and its effects on the environment.</p>	
2. What do you expect students to understand about this concept and be able to do as a result?	<p>Students should be able to explain the properties of water in each of the three states of matter. In their response they should be able to explain temperature, shape and volume (definite/indefinite) of water in each of the states. After their investigation with the ice cube they should be able to tell what causes water to change from one state to the next.</p> <p>At the end they should be able to list the uses of water as a solid, a liquid, or a gas and why it is important for water</p>	
3. Why is it important for students to learn this concept? (Rationale)	<p>Understanding the abundance of uses of water in each of the different states will make the world understandable. They need to know how we use water and why if water was not in a certain state, some things would not exist.</p>	
4. Provide an overview/ explain what teachers should know about this topic. What misconceptions do students typically have about this concept? (Lesson Background Info)	<p>-The three states of matter are Solid, Liquid and Gas. Some students might know that Plasma is also a state of matter. According to Merriam-Webster Online Dictionary, Plasma is (1) "A substance that is similar to gas but can conduct energy". Plasma is actually the most common state of matter in the Universe, even being found in places on earth. <--Not relevant but students surprise you when you least expect it.</p> <p>-Water goes from a solid to a liquid because heat that is applied causes it to melt and become liquefied. It can then go from a liquid into a gas in a process called evaporation. The process can also be reversed. A gas can change into a liquid using a process called Condensation. Once it is a liquid it can then change from a liquid to a solid through a process called freezing.</p> <p>-As a solid, water is called ice, snow, sleet, and hail. In this state water is cold, clear or cloudy. It will be clear if the water was brought to a boil first. It will have a definite shape that is either regular (can name the shape) or irregular (no name for shape, for example square, circle, triangle, pyramid, etc.).</p> <p>-As a liquid water can be many different temperatures. It will have an indefinite shape seeing as it takes the shape of the container or space it is put in. It will also have a definite volume, or an easily measured volume. In terms of weather, water would be called rain.</p> <p>-As a gas water has many different names. It is called steam, water vapor, or even clouds. The temperature will be hard to measure and usually isn't a property used to describe it. Water in this state will have an indefinite shape, seeing as it moves to fill up the space it is in, no matter how large it is. This also means it has an indefinite volume. Water in this state is also not going to have a distinguishable color, seeing as gases are invisible to the naked eye.</p> <p>Some student misconceptions are (1) The bubbles in boiling water contain "air", "oxygen" or "nothing", rather than water vapor. (2) Gases are not matter because most are invisible. (3) Melting/freezing and boiling/condensation are often understood only in terms of water.</p>	

7. What specific activities might be useful for helping students develop an understanding of the concept in each phase of the Learning Cycle?

Engage: Frosty the snowman video. Students will watch a video on the story of Frosty The Snowman (<http://www.youtube.com/watch?v=pmuJDmjq-xQ>) and will be instructed to pay close attention to Frosty. No other prompt will be given. At the end of the video students will Turn and Talk about Frosty and what they observed about him.

Exploration:

(1) Students will then participate in the classroom “Water Olympics” In 5 groups students will work through 5 different investigations surrounding water and its different properties. Before starting each event, students will need to predict the outcome before actually participating.

*Event #1, A-Mazing H₂O Race teammates will have to move a drop of water through a maze to the finish line without breaking apart.

*Event #2, H₂O Stretch, students will take a drop of water and stretch it as far it can go without breaking on the ruler given to them. Once the students realize it wont stretch very far, a small drop of liquid soap will be added and they will repeat the process of seeing how far it can stretch and recording their results.

*Event #3, Paper Towel Absorption Race, students will have 3 different brands of paper towel and place them in a bowl to see which one absorbs water up to the 18cm mark the quickest.

*Event #4, Fold and Float, each team will have a 5” by 5” piece of aluminum foil. They will fold it in half numerous times to see if it floats or sinks. After each individual fold, they will place it in water to see if it sinks or floats.

*Event #5, Bubble Ring, students will blow bubbles on a wet table surface using liquid soap and measure the diameter of the ring left behind once it pops.

**All predictions and results will be recording on a data chart and then differences between the two for each event will be calculated to see who had the lowest different between their prediction and outcomes to find the winner.

Both of these activities are designed to make students think about water in ways they didn’t before. Each event in the Olympics allows the student to observe different characteristics of water they might not have seen or even thought to question before. Like the fact that a drop of water will stay together until a drop of soap is added.

**** Move on to Explanation (1) ****

Classroom reading in Nat Geo textbook

Water as Solid- Read individually and then in table groups discuss: *How can you explain the difference in the properties of an ice cube and a book?*

Water as Liquid- Read individually and then in table groups discuss: *Compare the properties of water and ice and make a Venn Diagram in Science Notebook*

Water as Gas- Read individually and then in table groups discuss: *Why is it difficult to measure the volume and shape of water vapor/steam?*

****Once this is complete move onto (2) in Explanation****

2) Now that students have explored what water is students will investigate how water changes states over a period of time.

Each student will receive clear plastic cup, 1 ice cube, a piece of plastic wrap, and a rubber band. Observations will be made on the ice cube as it sits in the cup. Those observations will be written down in their notebooks in any form the student feels is best for them.

Once initial observations are complete students will place the plastic wrap over the top of the cup and place it outside in the sun. 1 hour later the students will make observations on their cup again. They will place it back in the sun. The next day students will observe their cup one last time.

Students will then Turn and Talk in their table group about what they observed with their ice cube and how it either changed or didn't change over the allotted time for the investigation.

Class Discussion- Ask students "What did you observe with your ice over the past day?" This will then allow the students to lead your discussion. You want them to end up with the knowledge that water moves through the states. Water can go from solid, to a liquid, to a gas. Once they have that it can move through them in that order, ask if it can move from gas to liquid to solid and how.

****Move on to explanation and complete (3) after this****

Explanation:

(1) In notebooks allow students to write down any knowledge they gained from the engage (the frosty video), and first exploration (The Water Olympics). They should be able to describe their findings and list any questions they now have about water and its properties.

(2) Students will draw the table below in Science notebook and fill it out individually.

State	Shape	Volume	Other Properties
Solid			
Liquid			
Gas			

(3) In notebook students will describe in detail the observations they made and what they learned from doing the investigation. This information will be used to determine what students, if any, need to complete the investigation again or if you can safely move on to the next thing. ****Move on to Extension 3****

(4) Give each table group a sheet of paper with Solid, Liquid, Gas, Matter, or Mass printed on the top. Each group will then have 1 minute to write down everything they now about or any questions they still have about what is printed on their sheet of paper. After the minute is over, 1 student from each group will pass their paper to the next group, it helps if you number the groups 1-5 and they have to hand it to the group that is the number after theirs.

If you see that students are still not understanding what you intended or still have misconceptions you need to go back and allow them to investigate for longer and maybe put the cups in different parts of the rooms.

Extension:

Tell students that everything we have been doing makes the world understandable. The ice cube represents how water changes through the states. The water that has condensed on the plastic wrap shows part of the water cycle. Show the students this video <http://www.youtube.com/watch?v=qyb4qz19hEk> it explains why water is important of humans and all other living things on the earth. It

	<p>also explains the impact humans have on the water cycle and how it is being affected.</p> <p>As a hanging questions that connects into the next learning cycle, as students if water is the only matter that goes through changes. Just let them sit on it and think about it.</p>
8. In what ways would you assess students' understanding or confusion about this concept?	<p>Formative Assessment:</p> <p>All of the explains are formative assessments that are used to understand students thinking and where they are in the process of learning the content. If students are stuck in one area, go back and go it again and scaffold questioning to get them where they need to be. Don't tell them what you want them to know, ask questions that guide them to the right path. Questions will need to be based on the content students are struggling with. This is where knowing your students and taking notes during instruction.</p> <p>Summative Evaluation:</p> <p>See below for performance task.</p>
9. What materials/ equipment are needed to teach the lesson?	Water, Ice cubes, clear plastic cups, plastic wrap, toothpicks, centimeter rulers, wax paper, water droppers, 3 different brands of paper towels, bowls, tin foil, Water Olympics procedures, Water Olympics recording sheet, Water Olympics Maze, Internet, straws, liquid dish soap, stop watch.
10. References (Please list all resources consulted in developing this form)	<p>AIMS Water Precious Water pgs 259-267</p> <p>Merriam-Webster Online Dictionary</p> <p>National Geographic Textbook</p>

Summative Assessment

Directions: On the back of this page you are to draw and label Water in the different states of matter. How you choose to create the picture(s) is up to you. You can do it as one cohesive picture, or as separate pictures. Make sure you include not only the different states and AT LEAST 3 different uses for water in each of the states.

Rubric for grading:

	0	1	2	3	4
Water in each of the states of matter	Water is not represented in any of the states of matter.	N/A	Water in 1 different state of matter is present.	Water in 2 different states of matter is present	Water in 3 different states of matter is present.
Uses Of Water in each state.	Uses of Water are not present in drawing(s)	1 use of water in each state is present.	2 uses of Water in each state are present	3 uses of water in each state are present	4 or more uses of water in each state are present
Labels	No labels are present on drawing(s) OR no labels are placed correctly on drawing(s)	1-2 labels are correctly placed on drawing(s)	3-5 labels are correctly placed on drawing(s)	6-8 labels are correctly placed on drawing(s)	8 or more labels are correctly placed on drawing(s)

Total: ___/12