

## **5E Arts Integrated STEM Lesson Plan – Template**

*This template serves as a guide for developing a lesson that integrates across subject areas and includes the components of a quality STEM lesson. Please use it to support your work and engage in discussions with your instructors and peers when you have questions.*

**Lesson Title:** Weight of Water

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**Topic:** State of Matter

**Targeted Grade Level:** 7th grade

**Time Needed:** Several Weeks

**Subject Integration:** Art, Science, Math, Engineering, Language Arts

**Justification:** Art and engineering work together to use the materials in the makerspace to create a device that changes the weight and volume of water. The class will use physical science to learn different states of matter. Measurements and calculations will be used for the math criteria. Students will write observations.

**Standards:** 7.RP.A; 7.NS.A., 7.SP.A, 7.SP.B, 7.SP.C,

1. The fact that matter is composed of atoms and molecules can be used to explain the properties of substances, diversity of materials, states of matter and phases changes.
2. Pose research questions, synthesize answers from multiple credible sources, and present conclusions in an appropriate format.

**NGSS Performance Expectations**

MS-PS1-1 Matter and its Interaction

MS.Structure and Properties of Matter

PS1A: Structure and Properties of Matter

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts:
<p>In both science and engineering, mathematics and computation are fundamental tools for representing physical variables and their relationships. They are used for a range of tasks such as constructing simulations; statistically analyzing data; and recognizing, expressing, and applying quantitative relationships.</p> <p>Scientists and engineers plan and carry out investigations in the field or laboratory, working collaboratively as well as individually. Their investigations are systematic and require clarifying what counts as data and identifying variables or parameters.</p> <p>Scientists and engineers must be able to</p>	<p>PS1: Matter and Its Interactions</p> <p>ETS1: Engineering Design</p>	<p>Cause and Effect</p> <p>Energy and Matter</p>

communicate clearly and persuasively the ideas and methods they generate. Critiquing and communicating ideas individually and in groups is a critical professional activity.

**Common Core State Standards**

**Math:** CCSS.MATH.CONTENT.7.SP.B.4

**ELA:** CCSS.ELA-LITERACY.RST.6-8.3

**National Art Standards**

VA:Cr1.1.7: Apply methods to overcome creative blocks.

VA:Cr1.2.7a: Develop criteria to guide making a work of art or design to meet an identified goal.

**Measurable Student Learning Objectives:**

Students will be able to create a device that changes the weight and volume of water.

Students will be able to measure the volume of water.

Students will be able to measure the weight of water.

Students will understand the idea of changing matter.

### **Nature of STEM:**

The students will be creating and engineering a device that changes the weight and volume of water. The students will be measuring weight and volume and recording observations.

### **Engaging Context/Phenomena:**

After an inquiry introduction, students will read [The Water Cycle](#), found on NASA's website. As a class we will watch [Water Cycle Song](#), which is a catchy song that the 7th graders will make fun of, but remember. Then as a class, we will discuss the several places they see the water cycle each day in their own lives. Once they begin to understand how the water cycle works, then they can start to create and construct their own devices to change the volume and weight of water.

### **Data Integration:**

Students will measure volume and weight of water. The measurements will then be analyzed so each student can make sense of why water changes weight and volume. The students will use the data from North Dakota State University of how much an inch of rain on one acre weighs. [Weight of Water per Acre from One Inch of Rain](#) This is the best way to integrate the data with my students because acres and inch of rain are two measurements they are familiar with on a daily basis.

### **Differentiation of Instruction:**

The best way to differentiate this lesson would be to provide skeleton notes for any students who may need them.

**Real-life Connection:**

The agricultural industry my students live in everything revolves around water in all of its forms. Water is extremely important to not only us to grow crops, but also for the existence of humanity. There are countless parts of the world where there is no water for people to drink.

**Possible Misconceptions:**

**Lesson Procedure:**

5E Model	5E Objectives
<b><u>Engage</u></b>	<p><b>Procedure:</b> Inquiry “Can the amount of water change?”</p> <p>Read “The Water Cycle”</p> <p>Watch “The Water Cycle Song”</p> <p><b>Modifications</b> Graphic organizers and modified quizzes on the reading may be useful for students who may need assistance.</p> <p><b>Standards Addressed</b> MS-PS1-1 Matter and its Interaction</p>

	<p>MS.Structure and Properties of Matter</p> <p>PS1A: Structure and Properties of Matter</p> <p><b>Formative/Summative Assessments:</b> Students will be assessed on participation during the inquiry and song. There will be a short quiz on “The Water Cycle” reading.</p> <p><b>Resources</b> I will need to provide “The Water Cycle” to the students and find “The Water Cycle Song” online.</p>
<p><u>Explore</u></p>	<p><b>Procedure:</b> Students will take 5 of the same cups of water and fill them up the same, but put them in different parts of the room and observe and record their observations over the next five days.</p> <p><b>Modifications</b> A worksheet and personal assistance from the teacher in measurement.</p> <p><b>Standards Addressed</b></p> <p>MS-PS1-1 Matter and its Interaction</p> <p>MS.Structure and Properties of Matter</p> <p>PS1A: Structure and Properties of Matter</p> <p><b>Formative/Summative Assessments</b> Students will explain what happened through statements that begin with “First”, “Then”, “Next, and “Last”</p> <p><b>Resources</b> Water, Cups, Different areas of the room (warmer, cooler, brighter, darker, etc.)</p>

<p><b><u>Explain</u></b></p>	<p><b>Procedure:</b></p> <ol style="list-style-type: none"><li>1. Students will fill a narrow graduated cylinder with exactly 1 cup of water.</li><li>2. Record the weight for a week.</li><li>3. Pour 1 cup of water into a short wide beaker.</li><li>4. Record the weight for a week.</li><li>5. Students will describe how the water levels changed in different containers.</li></ol> <p><b>Modifications</b></p> <p>Graphic organizer and teacher assistance.</p> <p><b>Standards Addressed</b></p> <p>MS.Structure and Properties of Matter PS1A: Structure and Properties of Matter</p> <p><b>Formative/Summative Assessments</b> Students will be able to explain water levels in different containers.</p> <p><b>Resources</b></p> <p>Water Graduated Cylinder Beaker Scale Ruler</p>
<p><b><u>Elaborate</u></b></p>	<p><b>Procedure:</b> Students will create a device that changes the weight and volume of water.</p>

	<p><b>Modifications</b> This is a great place for inclusion. Teacher may need to assist.</p> <p><b>Standards Addressed</b></p> <p>MS-PS1-1 Matter and its Interaction</p> <p>MS.Structure and Properties of Matter</p> <p>PS1A: Structure and Properties of Matter</p> <p><b>Formative/Summative Assessments</b> Students will be able to explain why or why not the device they created was able to change the weight and volume of water.</p> <p><b>Resources</b> Maker Space Materials</p>
<p><u>Evaluate</u></p>	<p><b>Procedure:</b></p> <ol style="list-style-type: none"><li>1. Students will fill a cup of water.</li><li>2. Measure height and weight.</li><li>3. Students will freeze the water.</li><li>4. Measure height and weight of frozen water.</li><li>5. Allow the same water to melt.</li><li>6. Measure height and weight of water.</li><li>7. Record all observations.</li></ol> <p><b>Modifications</b> No modifications should be necessary but assistance in the activity may be needed from the teacher.</p> <p><b>Standards Addressed</b></p> <p>MS-PS1-1 Matter and its Interaction</p>

	<p>MS.Structure and Properties of Matter</p> <p>PS1A: Structure and Properties of Matter</p> <p><b>Formative/Summative Assessments</b></p> <p>Students will be able to observe and explain the differences in weight and volume of liquid water compared to frozen water.</p> <p><b>Resources</b></p> <p>Water</p> <p>Cup</p> <p>Freezer</p> <p>Scale</p> <p>Ruler</p>
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**Teacher Background:** Teacher needs to understand the effects of different situations on the volume and weight of a liquid substance.