

# Bay Area Scientists in Schools Presentation Plan

**Lesson Name** Exploring States of Matter!

**Presenter(s):** The Sarpong Group

**Grade Level** 1st

**California Science Standards Connection(s):**

1-PS: States of Materials

- 1) Solids, liquids, gases have different properties
- 2) Substances change properties with mixing, cooling, heating

**Next Generation Science Standards:**

2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.</p> <ul style="list-style-type: none"> <li>• Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2)</li> </ul> <p>Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.</p> <ul style="list-style-type: none"> <li>• Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)</li> </ul>	<p>PS1.A: Structure and Properties of Matter</p> <ul style="list-style-type: none"> <li>• Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties. (2-PS1-1)</li> </ul>	<p>Patterns</p> <ul style="list-style-type: none"> <li>• Patterns in the natural and human designed world can be observed. (2-PS1-1)</li> </ul> <p>Structure and Function</p> <ul style="list-style-type: none"> <li>• The shape and stability of structures of natural and designed objects are related to their function(s). (1-LS1-1)</li> </ul>

**Common Core Standards:**

**ELA/Literacy:**

W.2.8 Recall information from experiences or gather information from provided sources to answer a question.

**Mathematics:**

- MP.2 Reason abstractly and quantitatively.
- MP.5 Use appropriate tools strategically.

**FOSS Connections:**

Grade 1 Module: Solids and Liquids



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## Abstract:

Students will have fun exploring solids, liquids, and gases at three stations. To develop definitions and understanding they will make predictions and discuss their observations and experiences.

## Vocabulary/Definitions:

Matter – the stuff everything around you is made of

State of Matter – a set of matter with similar properties

Solid – a state of matter that is often hard and has a fixed shape

Liquid – a state of matter that can be poured, often feels wet, and takes the shape of its container

Gas – a state of matter that you can't hold onto and completely fills its container

## Materials:

We will bring:

- |                   |                          |                         |
|-------------------|--------------------------|-------------------------|
| – Water Ice       | – Blue water             | – Argon balloon         |
| – Dry Ice         | – Oil                    | – Helium balloon        |
| – 2 Watch Glasses | – Yellow rubbing alcohol | – Liquid nitrogen       |
| – Coins           | – Test Tubes             | – Filter flask          |
| – Rubber Stoppers | – Pipettes               | – Balloons              |
| – Cork Stoppers   | – Plexiglass             | – Rubber Bands          |
| – Ping-Pong Balls | – Honey                  | – Aerosol Air Freshener |
| – Bouncy Balls    | – Maple Syrup            |                         |
| – Large Beaker    | – Paper towels           |                         |

## We will need:

- Water

## Classroom Set-up:

- We will talk to the teacher in advance to learn about their classroom setup and get tips from the teacher about the best way to divide the class into three groups for the stations segment of the lesson.
- Access to water would be helpful. If water is not available we can bring our own.

## Classroom Visit

### 1. Introduction

#### Personal Introduction:

**2 Minutes**

We are graduate students and postdoctoral researchers (can calculate “grade level” for the students) from UC Berkeley studying organic chemistry! We are originally from all over the world, but we all share a passion for science.



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**Topic Introduction:****10 Minutes**

Start by asking about/discussing matter with the students. Matter makes up everything around us, but it can take different forms. We will use water to illustrate the three states of matter.

Discussion: Write water in the top center of the board. Ask the students what other things they know that behave like water and write these other liquids on the board under water. Ask the students what happens when you make water very cold—it forms ice! Write ice to the left of water. Ask the students what other things they know that are similar to ice and write these other solids under ice. Now ask the students what happens when you make water very hot—it forms steam! Write steam to the right of water and ask the students what other things they know that are similar to steam and write these other gases under steam.

With these lists filled out, ask the students what the items in each list have in common. The ice column has things that are hard and have a fixed shape; the water column has things that can be poured and feel wet and take the shape of their container; the steam column has things that you can't hold onto and fills their entire container. Explain that these are the three states of matter, which we call solid, liquid, and gas!

At the end of this discussion, there should be a chart on the board like this:

Ice	Water	Steam
[Examples]	[Examples]	[Examples]
Hard	Wet; Can be poured	Can't hold onto
Has a shape	Takes shape of container	Fills the entire container
<b>SOLID</b>	<b>LIQUID</b>	<b>GAS</b>

Demo: Place a small piece of water ice and a small piece of dry ice each on a separate watch glass. Walk the two ices around the class so everyone can see, and ask them to make observations of what they see. Ask the students what state of matter the ices are. Tell the students we will come back to these at the end of the lesson.

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## 2. Learning Experience(s):

**30 Minutes**

For the bulk of the lesson, the students will be divided up into three groups to visit stations (~10 minutes/station).

### Solid Station:

Introduction to solids- What makes something a solid? Solids have definite shapes; some solids are hard, others are soft and squishy; some are heavy, others are light. Ask the students for examples of solids they already know.

Activity- Float or Sink? Students will have the opportunity to touch several different solids and describe their properties. One specific property that will be explored is density. Students will predict whether an object will float or sink, then place the object in a large beaker of water to test their hypothesis. Objects will include but are not limited to: pennies, rubber stoppers, cork stoppers, ping-pong balls, and bouncy balls.

### Liquid Station:

Introduction to liquids- What makes something a liquid? All liquids take the shape of their container, but the liquid will stay in the container on its own, without a lid. Ask the students for examples of liquids they already know.

Demonstration- Exploring the mixing of liquids. Some liquids will mix with each other and others will not. To demonstrate this property of liquids (a) water colored blue will be added to a test tube by pipette followed by oil; the students will observe two layers because water and oil will not mix and (b) water colored blue will be added to a test tube followed by rubbing alcohol colored yellow; the two liquids will mix to make a green solution!

Activity- To explore another property of liquids, viscosity (how thick a liquid is), students will have races with different liquids down an inclined plane. Students will pipette a drop of liquid onto Plexiglas on an incline. Potential liquids include: oil, water, honey, rubbing alcohol, etc. Students will be able to observe the different speeds of the different liquids.



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### Gas Station:

Introduction to gases- What makes something a gas? All gases expand to fill their container. Ask the students for examples of gases they already know.

### Demonstrations-

Gas has mass! Two balloons of equal size, one containing helium and the other argon, will be demonstrated. For ease of handling, the two balloons can be tied to each other with a ribbon. Hold out the two balloons at mid-height and ask the students what they think will happen when you let go, then release both balloons at the same time. When released, the argon balloon will sink and the helium balloon will float because they weight different amounts! You can pass the balloons around to let the students feel the difference in the weight of the balloons.

Gas spreads out to fill its container! To demonstrate that gases expand to fill the container they are in, an aerosol air freshener will be sprayed at one side of the room. Students will be asked to raise their hands when they can smell it; soon everyone will be able to smell the diffused aerosol.

Gas takes up space! Liquid nitrogen will be poured into a filter flask that has a balloon over the side arm. When the flask is capped with a rubber stopper, the balloon will quickly begin filling with nitrogen gas demonstrating that gas takes up space. When the stopper is removed, students can hear the gas rushing out of the flask into the room.

### **3. Wrap-up: Sharing Experiences and Building Connections      5 Minutes**

We will bring everyone back to one group to review the exciting things learned that day. Each station leader will review the demonstrations, experiments, and key words learned at each station.

Demo Conclusion: The watch glasses that held the water ice and the dry ice from the beginning of the lesson will be brought back out and the students will be asked to make new observations and describe what happened. Both ices, which were solids originally, have changed their state of matter! The water ice turned from a solid into a liquid, and the dry ice turned from a solid into a gas!

### **4. Close & Clean-up      3 Minutes**

Ask the students if they have any questions about the experiments we performed or about being a scientist in general!

TOTAL   50   Minutes



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## **Differentiated Instruction:**

English Learners: Repeat directions, if necessary, and physically model how to perform activities at each station. Write vocabulary, e.g. solid, liquid, gas, on the board and read words aloud. Vocabulary words can also be visually demonstrated, e.g. using an illustration, and/or redefined in very simplistic terms.

Advanced Learners: Have students think of other examples of solids, liquids, and gases.

## **Follow-up Possibilities**

### **ELA Activity:**

Students respond to the following journal prompt:

-Write a letter to a friend telling them about what you learned about solids, liquids, and gases. Give an example of each.

### **Reading:**

- A Drop of Water by Walter Wick <http://www.amazon.com/Drop-Of-Water-Science-Wonder/dp/0590221973>
- Everything Is Matter by David Bauer (also available in Spanish) <http://www.amazon.com/Everything-Matter-Yellow-Umbrella-Books/dp/0736829423>
- Matter by Christine Webster <http://www.amazon.com/Matter-First-Facts-Physical-World/dp/0736826173>

### **Mathematics Activity:**

-Have students count and add the number of liquids, solids or gases they can find in their homes. Students can also graph the data.

### **Other:**

Students explore outside play area and record what states of matter they observe.



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