

3-5 Physical Science
3-5 Nature of Science



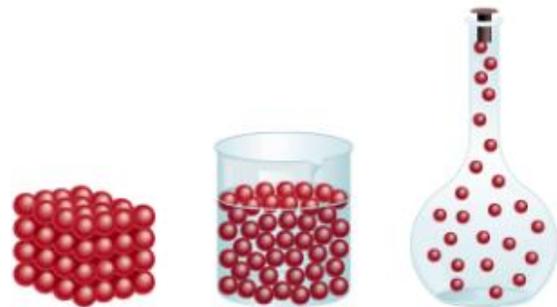
Southern Nevada Regional Professional Development Program

What's the Matter?

(Lesson modified from Investigating Solids, Liquids, and Gases with Toys)

INTRODUCTION

Children are constantly investigating different states of matter in their daily lives. This investigation takes them through an inquiry based investigation to determine the state of matter when concealed in a rigid container.



WHERE'S THE SCIENCE?

All matter is made up of particles. The particles behave differently in each state of matter. There are three states of matter; solids, liquids, and gases. The particles in solids are close together and simply vibrate. Solids have a definite shape. The particles in a liquid slip and slide past each other. Liquids take the shape of the container in which they are placed. They have no definite shape. The particles in a gas move quickly and bounce off each other. Gases spread out and fill the containers in which they are placed.

During the egg investigation when determining the contents of the eggs, the students must observe the properties of each egg. Some properties

will be the same; size, shape, and color of the egg, while others will depend on what is inside the egg. The mass of each egg will depend on what is placed inside the balloon. If using sand, that egg will have the greatest mass. The balloon with air will always have the lowest mass. Another property to observe is how the egg spins. The egg with the liquid inside will wobble when spun, as does the gas-filled egg. The gas-filled egg will stop, however, when touched and stay in one place. The fluid-filled egg will continue to move after touched. This is because the fluid inside the eggs continues to move and therefore resists the touch that is applied to the egg. The solid-filled egg will move quickly and stop moving when the “touch test” is conducted. This is because the solid egg moves as one unit. The observations of the real eggs will be very similar to the observations of the plastic filled eggs. The behavior remains the same because the contents are in the same state.

MATERIALS

(per group)

- 3 Beakers (or clear containers)
- 3 Sticky notes
- 3 Different colored plastic Easter eggs
- 3 Balloons
- Small brown paper bag
- Water
- Sand
- Scotch tape
- Hardboiled egg
- Raw egg
- Blown out egg
- Hand lenses
- Electronic balance (optional)
- Science Notebooks



NOTE: The balloons must be prepared beforehand. Place enough sand in the balloon to fit snugly inside the plastic egg,

and then tie it off. Repeat with water and air until you have three balloons with the three states of matter for each group.

PROCEDURES

Lesson One

1. Invite the students to the carpet area and ask them what they think they know about solids, liquids, and gases. Discuss the three states of matter. Ask students to list known solids, liquids, and gases. Chart their responses.
2. Tell the students that today they will be making observations of each of the three states of matter. They will include their observations in their science notebooks. After they are finished observing, they should label each beaker as containing either a solid, liquid, or gas.
3. Instruct the students to send a person to the materials table to get a beaker with sand, a beaker with water, and an empty beaker (full of gas) and return to their group. Instruct them to label the beakers 1, 2, and 3. The students will then observe the contents of each of the three containers. Encourage them to use a hand lens when making their observations. Sketching diagrams is also helpful when recording their observations.
4. If they are having trouble determining the state of matter ask them if the material takes the shape of the container, or keeps its shape. Tell them that liquids have no definite shape and take the shape of their container.
5. Instruct them to create a list of solids, liquids, and gases found in the classroom when they are finished observing the contents of the beakers.
6. When the observations are complete, call the students to the carpet area and ask them which one beaker contains the solid, the liquid, and the gas. Discuss the three states of matter. Ask students to return to their list of known solids, liquids, and gases. Is there anything they would like to move to another category? Why? Chart their responses and further questions.

Lesson Two

1. Show the students the beaker of sand, the beaker of water, and the beaker full of gas from the investigation yesterday. Review the three states of matter.
2. Introduce the balloons with the three states of matter inside. Instruct the students to observe the three different balloons, in their groups, and record their properties in their science notebooks. Which one has the solid? Liquid? Gas? How do you know?
NOTE: These balloons should be prepared beforehand and fit snugly inside the plastic eggs for lesson three. Each balloon contains one state of matter; sand, water, and air.
3. Discuss what the students did to determine what state of matter was in each balloon. How did they test the balloons? Chart any similarities or difference between materials.
4. Introduce the challenge. Tell the students that they will now need to determine the state of matter when the balloons are placed inside rigid containers, the plastic eggs.
5. Explain that they will need to conduct an investigation to figure out which egg has the solid, the liquid, and the gas inside. They will need to compare similarities and differences of the eggs when put through different tests. They must observe the behavior of the eggs very closely. Remind them to record their data in their science notebooks during the investigation.
6. Tell the students to send one person to the materials table to get a small brown paper bag, tape, and three plastic eggs (all different colors). Instruct each group to place one balloon in each of the three eggs and seal with a piece of tape. Place the eggs back in the bag and pass to the next group. Tell them to put their names or group number on the paper bag to ensure the same eggs are used during each part of the investigation. Once each group has received their plastic eggs, they may begin their investigations. Remind them that they are not to open the eggs at any point during the investigation. **NOTE:** Placing the materials in the paper bags ahead of time reduces any confusion and saves time.

7. Instruct the students to draft a plan outlining how they will test the eggs **BEFORE** they actually test anything. They should conduct at least two separate tests on the eggs. Remind them that several trials of each test are necessary to confirm reliable results.
8. Once each group has finished investigating, call the students to the carpet area and discuss how each group tested their plastic eggs. Did they stand them up on one end? Roll them? Shake them? Ask the reporter for the group to share out their results and prediction of what state of matter is inside the egg. Record their ideas on chart paper.

Lesson Three

1. Invite the students to the carpet area to review their results from the investigation they conducted on the plastic eggs. Ask them if they have any other ideas to test the eggs to help determine the contents inside. Chart their ideas.
2. Introduce the “touch test” by suggesting a new way to test the eggs, a “touch test”. Model how to perform the “touch test” on the plastic eggs. Tell them to place one finger on a spinning egg just hard enough to stop the egg. They should then record their observations of each egg. Tell them they may have to repeat this test several times to get accurate results because some of the behaviors they will observe are subtle changes. **NOTE:** See **WHERE’S THE SCIENCE?** for explanation.
3. Instruct the students to gather their same bags from yesterday with the three plastic eggs inside (still taped). Conduct three trials of the “touch test” on each egg and record all results in their science notebooks. Go back to the initial prediction made about the state of matter in each egg. Given the new test results, they may modify their predictions.
4. Once the investigation is complete, tell the students to remove the tape and open the plastic eggs. Was their prediction correct? Record the state of matter in each egg.
5. Call the students together once the investigation is complete and discuss the “touch test”. Did this help them determine the state of

matter in the egg? What were their observations? How do solids behave? Liquids? Gases? Chart responses and further questions.

Lesson Four

1. Gather the students at the carpet area and review the three states of matter. Tell them that today they are going to apply what they have learned about how solids, liquids, and gases behave when all are placed inside a rigid container..... a real egg shell.
2. Challenge the students to determine the state of matter in each of three eggs given; a raw egg, a hardboiled egg, and a blown out egg. Instruct them to use their prior knowledge gained from the plastic egg investigation to solve the mystery of the eggs. **NOTE:** To create a blown out egg, simply place a small hole in both ends of the egg and blow. The liquid contents of the egg will then be expelled from the egg. There will be two small holes, making this the easiest egg to identify.
3. Instruct the students to send one person to the materials table to get their paper bag (already labeled with their names) with the three eggs already inside.
4. Tell the students to draft a plan of how they want to test the eggs and record this plan in their science notebooks. Once they know how they will test the eggs, they may begin their investigation. Remind them that several trials are necessary.
5. Once all groups have concluded their investigations, instruct them to crack open the eggs to determine the state of matter in each egg. Tell them to record their results in their science notebooks. Instruct the students to wash their hands after handling the eggs.
6. Close the lesson by discussing what they learned about the three states of matter. Were they able to apply what they learned about the states of matter in the plastic eggs when replaced with the real eggs? Record the students' responses and further questions on chart paper and post.

Extensions:

- Students create graphs or charts based on the data collected during their investigations.
- Replace the three states of matter in the balloons with liquids of different viscosities and repeat the investigation.

Additional Resources

<http://www.bbc.co.uk/schools/ks2bitesize/science/materials.shtml>

Interactive resources on the different states of matter.

<http://classroom.jc-schools.net/sci-units/matter.htm>

Resources on the states of matter.

Sarquis, J. *Investigating Solids, Liquids, and Gases with Toys*. Terrific Science Press, 1997

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Vocabulary

Gas: Matter that has no definite size or shape.

Liquid: Matter that flows freely. Water is one kind.

Matter: The material that everything in the universe is made of. It can be solid, liquid, or gas.

Molecule: The smallest part of a substance that is made up of two or more atoms.

Particle: A small piece of solid matter.

Property: A characteristic of an object that can be observed, such as size, color, shape, or texture.

Rigid: Describes something that is not flexible.

Solid: Matter that has a definite shape and always takes up the same amount of space.

Variable: Something that can be changed.

Safety Reminder

Students must wash their hands after handling raw eggs.

Nevada State Science Standards

P5A1 Students know matter exists in different states (i.e., solid, liquid, gas) which have distinct physical properties. E/S

N5A1 Students know scientific progress is made by conducting careful investigations, recording data, and communicating the results in an accurate method. E/S

N5A5 Students know how to plan and conduct a safe and simple investigation. E/S

N5B3 Students know the benefits of working with a team and sharing findings. E/L