



3rd Grade Science Unit:
State Your Matter!
Unit Snapshot

Topic: Matter and Forms of Energy

Grade Level: 3

Duration:
15 - 30 minute class periods

Summary

The following activities allow students to focus on the relationship between matter and energy. Students will realize matter has specific properties and is found in all substances on Earth.

Clear Learning Targets

"I can"...statements

- ___ demonstrate that heating and cooling causes matter to change its states and properties.
- ___ recognize that there are three states of matter which are commonly known as solids, liquids and gases.
- ___ explain that shape and compressibility are properties that are used to distinguish between the states of matter.
- ___ identify different properties of solids, liquids and gases.
- ___ employ simple equipment and tools to gather data and extend knowledge on the states of matter.
- ___ obtain, evaluate, and ask questions about the observations and explanations of other students' thinking about observations on the states of matter.
- ___ communicate about observations, investigations, and explanations of my learning as I present my finished products on the different states of matter and their properties.

Activity Highlights and Suggested Timeframe

Day 1	Engagement: Teacher demonstrates heating water to change it to water vapor and then uses a cold spoon to show condensation. The students will make a foldable comparing/contrasting the three states of matter.
Days 2-4	Exploration: Students will create their own investigation using various liquids to test which ones can become a solid when put in a freezer and which ones evaporate and change to a gas when heat is added.
Days 5-8	Explanation: Students will read and perform a Readers' Theatre to uncover the science behind the states of matter. Then they will complete a template about "Why Matter Matters". Students will complete the "Drop by Drop" Investigation in the 4 th Grade Textbook and read about physical changes in matter from Chapter 6.
Days 9-13	Elaboration: Students will choose between making a collage and conducting an experiment to demonstrate the three states of matter and its properties while performing a Matter Chant. ****This could be video taped and used as a Videoconference with another school in your Region or performed live in front of another third grade class at your school.

Day 14 and on-going	Evaluation: Formative and summative assessments are used to focus on and assess student knowledge and growth to gain evidence of student learning or progress throughout the unit, and to become aware of students' misconceptions related to states of matter and its properties. Using teacher observations, student/teacher conferences, class discussion and teacher-made assessment rubrics of the various activities, students will have immediate feedback on their learning experiences. A teacher-created short cycle assessment will be administered at the end of the unit to assess all learning outcomes.
Day 15	Extension/Intervention: Based on the results of the short-cycle assessment, facilitate extension and/or intervention activities.

LESSON PLANS

NEW LEARNING STANDARDS:

3.PS.2 Matter exists in different states, each of which has different properties.

Related The most common states of matter are solids, liquids and gases.

Shape and compressibility are properties that can distinguish between the states of matter. One way to change matter from one state to another is by heating or cooling.

CONTENT ELABORATION:

Grade 3 Concepts:

Gases, liquids and solids are different states of matter that have different properties. Liquids and solids do not compress into a smaller volume as easily as do gases. Liquids and gases flow easily, but solids do not flow easily. Solids retain their shape and volume (unless a force is applied). Liquids assume the shape of the part of the container that it occupies (retaining its volume). Gases assume the shape and volume of its container. Heating may cause a solid to melt to form a liquid, or cause a liquid to boil or evaporate to form a gas. Cooling may change a gas into a liquid or cause a liquid to freeze and form a solid.

Conducting experiments or investigations that demonstrate phase changes, such as the melting or freezing of substances other than water (e.g., vinegar, vegetable oil, sugar, butter), must be used to reinforce the concept that materials other than water also go through phase changes.

Note 1: Purdue University provides a table that can help in differentiating the properties of solids, gases and liquids. Teaching about the atomic structure as related to the phases is not appropriate for this grade level.

Note 2: Only solids, liquids and gases are appropriate at this grade, even though other phases have been identified. The differences between boiling and evaporation are not dealt with at this grade.

SCIENTIFIC INQUIRY and APPLICATION PRACTICES:

During the years of grades K-12, all students must use the following scientific inquiry and application practices with appropriate laboratory safety techniques to construct their knowledge and understanding in all science content areas:

- Asking questions (for science) and defining problems (for engineering) that guide scientific investigations
- Developing descriptions, models, explanations and predictions
- Planning and carrying out investigations
- Constructing explanations (for science) and designing solutions (for engineering) that conclude scientific investigations.
- Using appropriate mathematics, tools, and techniques to gather data/ information, and analyze and interpret data.
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating scientific procedures and explanations

*These practices are a combination of ODE Science Inquiry and Application and Frame-work for K-12 Science Education Scientific and Engineering Practice

MATERIALS:

Engage

- A pot filled with water
- A heat source (electric skillet or hot plate)
- Multiple oven mitts
- Numerous cold metal spoons (perhaps kept in a small frig. or cooler with ice cubes)
- An empty glass
- One sheet of cardstock or heavy paper per student

Explore

- Collect appropriate liquids for students to test. Suggestions are, but are not limited to:
vinegar, cooking oil, water with dish soap added, water with salt added, water with baking soda added, etc.
- Ice cube trays
- Heat source
- Freezer
- Old pots for heating liquids
- Measuring cups

Materials for Properties of Matter Centers

- 3 syringe type containers (Contact the Science Dept. for availability)
- Sand
- Water
- Various liquids for testing
- Plastic containers of various sizes and shapes
- Beakers for measuring volume
- Small blocks or cubes
- Various solid objects
- Clay
- Balloons of various shapes and sizes
(latex gloves and baggies can be used)

Explain

- Copy of the Readers' Theatre "Why Matter Matters" for each student
- Activity sheet for each student "Why Matter Matters"
- Copy of the 4th Grade Text (Gray Wolf) for each student
- Eye droppers
- Water
- Vegetable oil
- Rubbing alcohol
- 3 Styrofoam plates or petri dishes per each table group
- Safety goggles

Elaborate

- Various materials as determined by students to conduct their state of matter demonstration
- Magazines
- Scissors
- Poster boards or Display Boards
- Computer with Internet Access
- Copies of "Matter Chant" for each student
- ***Optional Videoconferencing set-up of equipment (Contact: Mike Mirarchi, Videoconferencing Coordinator, 365-5184)

VOCABULARY:

Primary

Compressibility
Condensation
Cooling
Energy
Evaporate
Freezing
Gas
Heating
Liquid
Matter
Melting
Phase Change
Properties
Solid
States of Matter
Volume

Secondary

Condense
Texture
Transform
Water Vapor

STUDENT KNOWLEDGE: (from standards document)

Prior Concepts

PreK-2: Materials can be sorted by properties. The physical properties of water change as observed in weather (ESS).

Future Application of Concepts

Grades 4-5: The amount of mass* and matter remains the same during phase changes.

Grades 6-8: Atomic theory is introduced. Properties of solids, liquids and gases are related to the spacing and motion of particles. Thermal energy and temperature are related to the motion of particles.

*While mass is the scientifically correct term to use in this context, the NAEP2009 Science Framework (page 27) recommends using the more familiar term "weight" in elementary grades with the distinction between mass and weight being introduced at the middle school level. In Ohio, students will not be assessed on the differences between mass and weight until Grade 6.

SAFETY	<ul style="list-style-type: none">• Engagement: Make sure students do not stand directly over the pot of boiling water to keep from getting steam burns. *Caution students not to touch the pot or the water.• Explore: Caution students not to blow on other students' balloons. Remind students not to over blow up balloons. Review the science lab rule: Never eat or drink anything during a science lab.	
ADVANCED PREPARATION	<ul style="list-style-type: none">• Engage: Collect the aforementioned supplies for the demonstration. Begin heating the water at least five minutes before scheduled time for the class to begin.• Explore: Collect the needed supplies for student investigation. Run off copies of the lab sheets for each student.• Explain: Run off copies for "Why Matter Matters" Readers Theatre and activity sheet. Collect items for Investigation on p. 253 of 4th Grade Textbook. Obtain copies of 4th Grade Text (Gray Wolf cover) from the 4th grade teachers.• Elaborate: Run off copies of "Matter Chant" for each student. Collect materials needed for collages and Matter demonstrations.• ***Optional: Set up Videoconferencing date and equipment with Mike Mirarchi (365-5184) or time and location to present "T.V. Spot" with another class at your school.	
ENGAGE (1 Day) (What will draw students into the learning? How will you determine what your students already know about the topic? What can be done at this point to identify and address misconceptions? Where can connections be made to the real world?)	Objective: Students will observe water changing from one state (liquid) to another (gas) and back again when heat is added or taken away. Students will create a foldable to help compare and contrast the properties of the three states of matter.	
	<i>What is the teacher doing?</i> Water Demo (Day 1) <ul style="list-style-type: none">• Heat the water on the stove.• Bring the students up in groups of 2 or 3. Have them put on the oven mitts. Point out the bubbles rising to the surface of the water. These are bubbles of water vapor.• Have a student hold a cold spoon over the water vapor rising from the pot.• Now have the student move the spoon away from the boiling water. Have another student hold a glass underneath the spoon to catch any water droplets.	<i>What are the students doing?</i> Water Demo (Day 1) View the teacher demo: <ul style="list-style-type: none">• Come to the heat source in pairs or trios. Put the oven mitts on to view and participate in the demo.• View the bubbles in the water as the heat is added.• Hold a cold spoon over the water vapor rising from the pot.• Now have students move the spoon away from the boiling water. Have another student hold a glass underneath the spoon to catch any water droplets.

	<ul style="list-style-type: none"> • After the entire class has participated in the demo, hold a discussion with the students. • Tell them they transformed water from one state to another. • Ask how and when they did it. (By using heat and cooling they transformed a liquid to a gas and back again). • <i>Explain that the molecules in liquid water are constantly moving around, bumping into each other like bumper cars at a fair. When the water is heated, the molecules move faster and faster. Some of them shoot right out of the pot and into the air. They become water vapor, an invisible gas.</i> • <i>This process of changing from a liquid to a gas is called <u>evaporation</u>. Boiling is a special case of evaporation. Water vapor doesn't just escape from the surface; it escapes from the bottom, middle and top. That's why they see lines of bubbles in the pot.</i> • When they cooled the water with the spoon, they reversed the process. <i>Cooling water vapor into liquid water is called condensation.</i> <p>Foldable:</p> <ul style="list-style-type: none"> • Pass out cardstock or heavy 8 1/2 by 11 sheets of paper to each student. Have students make a matchbook, three-flap foldable by following these steps: • Assist students with folding directions. • Facilitate as student label, draw pictures. 	<p>Foldable:</p> <ul style="list-style-type: none"> • Fold a sheet of paper like a hamburger (on the short line of symmetry) but fold it so that one side is one inch longer than the other side (the front will be one inch shorter than the back). • Fold the one inch tab over the short/front page forming an envelope-like (matchbook) fold. • Cut the front flap into three equal parts from the base up to the mountain top (top fold) to create three flaps.
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		<ul style="list-style-type: none"> • Label the lip “<i>The Three States of Matter.</i>” On one flap label it <i>Solid</i>, the second one <i>Liquid</i>, and the third one <i>Gas</i>. • Draw a picture of what water looks like when it is in each of these forms on the front flaps under the title. • Put the book in a safe place for use in future activities.
<p style="text-align: center;"><u>EXPLORE</u> (3 Days) (How will the concept be developed? How is this relevant to students' lives? What can be done at this point to identify and address misconceptions?)</p>	<p>Objective: Students will compare different types of liquids to investigate which will become gases when exposed to a heat source and which ones can become solids when exposed to freezing temperatures.</p>	
	<p><i>What is the teacher doing?</i></p> <p>Liquid Investigations (Days 2 -3)</p> <ul style="list-style-type: none"> • Collect six appropriate liquids for students to test. (Teacher might have to have fewer if time is a factor.) Suggestions are, but are not limited to: vinegar, cooking oil, water with dish soap added, water with salt added, water with baking soda added, etc. • Building on the knowledge gained from the Engagement lesson, invite students to look at the different liquids and make a hypothesis as to which ones could freeze to form a solid when placed inside a normal freezer overnight, and which will boil and change to a gas when placed over a heat source. • Outline the steps of the lab (numbers 3 – 9) with students. Pass out the lab sheets and allow students to begin their investigations. Repeat these steps per each table group until all the liquids have been placed in the freezer and boiled on the heat source. 	<p><i>What are the students doing?</i></p> <p>Liquid Investigations (Days 2-3)</p> <ol style="list-style-type: none"> 1. Look at the various liquids the teacher has collected. 2. Teacher will call up one student to select one liquid for their investigation. 3. One table group will make a hypothesis involving that liquid, what will happen when exposed to the heat source and what will happen when it is placed in the freezer and record it on their lab sheet. 4. List the materials needed to conduct their investigation on the lab sheet. 5. Measure the amount of the liquid needed to fill one section of the ice cube tray. 6. Label (through use of a permanent marker or a label) the type of liquid in each section of the ice cube tray. Place the tray in the freezer once the class has filled all the sections. 7. Measure out one cup of the liquid and place it in the pot for heating. Give the pot to the teacher to heat and observe what happens.

	<p>Properties of Matter Centers (Day 4)</p> <ul style="list-style-type: none"> See teacher page (Explore-Teacher Page- Properties of Matter Centers) for the directions on how to set up the five centers on compressibility, matter flow, retention of shape and volume. 	<ol style="list-style-type: none"> Write up this procedure step by step on the lab sheet. Put the lab sheet in a folder. Tomorrow, complete the observation and conclusion sections of the lab sheet after removing your sample from the freezer and observing any changes in state. Add any additional findings to the "Three States of Matter" matchbook from the Engagement activity. <p>Properties of Matter Centers (Day 4)</p> <ol style="list-style-type: none"> Follow the directions at each of the five centers and write your results in your Three States of Matter matchbook in the appropriate section.
<p style="text-align: center;"><u>EXPLAIN</u> (4 Days)</p> <p>(What products could the students develop and share? How will students share what they have learned? What can be done at this point to identify and address misconceptions?)</p>	<p>Objective: Students will learn more about the science behind the three states of matter through reading of a theater script and activity "Why Matter Matters".</p>	
	<p><i>What is the teacher doing?</i></p> <p>Why Matter Matters (Day 5)</p> <ul style="list-style-type: none"> Pass out copies of the Readers' Theatre script "Why Matter Matters". Assign students the two main parts of the script (Narrator and Teacher). Have a team of four students be Team 1. Have a team of four students be Team 2. The rest of the class will read the parts for the entire class chorally. Now have the class read the Readers' Theatre script. <p>(Day 6)</p> <ul style="list-style-type: none"> Pass out copies of the "Why Matter Matters" activity sheet and have students complete them in pairs, singularly, or table groups. Go over the activity sheet as a class and add to science portfolio. 	<p><i>What are the students doing?</i></p> <p>Why Matter Matters (Day 5)</p> <ol style="list-style-type: none"> Reading assigned parts in the Readers' Theatre script "Why Matter Matters". <p>(Day 6)</p> <ol style="list-style-type: none"> Complete the corresponding activity sheet for "Why Matter Matters". Participate in the class discussion of the sheet. Add the activity sheet to their science portfolio.

	<p>(Day 7)</p> <ul style="list-style-type: none"> • Pass out copies of 4th Grade Text. • Organize materials for Investigation on page 253 of 4th Grade Text. • Have students conduct Investigation “Drop by Drop” p. 253 in table groups, partner teams or singularly. • Have students write up “Draw Conclusions” p. 253 in their Science Journal. <p>(Day 8)</p> <ul style="list-style-type: none"> • Read together and discuss “States of Matter” pp. 254 – 258 in the Fourth Grade Textbook. Have students write in their Science Lab Journal a summary for #2 on p. 259. 	<p>(Day 7)</p> <ol style="list-style-type: none"> 1. Organize the materials for Investigation on page 253 of the 4th Grade Text. 2. In table groups or teacher assigned team, conduct the Investigation on page 253 as written. 3. Wait fifteen minutes between observation times (teacher will tell you when to stop other work and record your observations in your Science Lab Journal). 4. Write up “Draw Conclusions” p. 253 in your Science Lab Journal. <p>(Day 8)</p> <ol style="list-style-type: none"> 1. Read and discuss together “States of Matter” pp. 254 – 258 in the Fourth Grade Textbook. 2. Write in your Science Lab Journal your summary for #2 on p. 289. 3. Share your summary with a partner. Did you miss some key elements? Do you need to include additional information for your summary?
<p style="text-align: center;"><u>ELABORATE</u> (5 Days)</p> <p>(How will the new knowledge be reinforced, transferred to new and unique situations, or integrated with related concepts?)</p>	<p>Objective: Given student choice of product, students will demonstrate a science experiment on the states of matter or create and display three collages of the states of matter via a mock television show to show their learning of matter and its properties.</p>	
	<p><i>What is the teacher doing?</i></p> <p>TV Show (Days 9 – 13)</p> <ul style="list-style-type: none"> • Explain to the students that they are going to present a “Television Show” for other third graders about matter and its properties. • Divide the students into teams of 3 to 4 students. • Give them the option to choose between the following two activities to present for the “TV show.” <p>Option #1: For the Student Experiment Demo (At teacher discretion, the student demo of a science lab could be for students needing enrichment)</p> <ul style="list-style-type: none"> • Tell students: If you are doing the experiment demo you will need to do research on the Internet or choose one of the experiments we 	<p><i>What are the students doing?</i></p> <p>TV Show (Days 9 – 13)</p> <ol style="list-style-type: none"> 1. With the team, choose between the two options for the TV Show. <p>Option #1 is to present a lab demonstration of a state of matter experiment. If you are doing the experiment demo you will need to do research on the Internet or choose one of the experiments we conducted together in class. You will prepare it for a short demonstration in front of our</p>

	<p>conducted together in class. You will prepare it for a short demonstration in front of our viewing audience to help them understand about one or more of the states of matter. You must have teacher approval of this demonstration before collecting the necessary supplies and practicing it for the show. (Teacher discretion as to whether or not you will allow students to conduct any lab which needs a heat source.)</p> <p>Option #2: For the Collage (At teacher discretion, the collage could be for students needing intervention)</p> <ul style="list-style-type: none"> • Tell students: If you are doing the collage of the states of matter you will need to use three poster boards. Write the title SOLID on one, LIQUID on another and GAS on the third. • Now have students use magazines and the Internet to locate pictures of the three states and affix them to the appropriate poster. Tell students they will be sharing these on the TV Show so they need to be prepared to describe how each collage is an example of the state of matter. • Give students copies of the "Matter Chant". Decide what tune you will use for the chant. • Practice the chant • Determine what order you want student groups to present on the show. • Intersperse one presentation of either a collage or a lab demo with all of the students performing one verse of the chant and so on to vary the presentations. 	<p>viewing audience to help them understand about one or more of the states of matter. You must have teacher approval of this demonstration before collecting the necessary supplies and practicing it for the show.</p> <p>Option #2 is to present a collage of the states of matter. You will need to use three poster boards. Write the title SOLID on one, LIQUID on another and GAS on the third. Now use magazines and the Internet to locate pictures of the three states and affix them to the appropriate poster. Be prepared to describe how each collage is an example of the state of matter.</p> <ol style="list-style-type: none"> 2. Practice the "Matter Chant". 3. Practice your presentation for the TV show.
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<p style="text-align: center;">EVALUATE (on-going)</p> <p>(What opportunities will students have to express their thinking? When will students reflect on what they have learned? How will you measure learning as it occurs? What evidence of student learning will you be looking for and/or collecting?)</p>	<p>Objective: Using teacher observations, student/teacher conferences, class discussion and teacher-made assessment rubrics of the various activities, students will have immediate feedback on their learning experiences. A teacher-created short cycle assessment will be administered at the end of the unit to assess all learning targets.</p>	
	<p>Formative <i>How will you measure learning as it occurs?</i></p> <ul style="list-style-type: none"> • Consider developing a teacher-created formative assessment. <ol style="list-style-type: none"> 1. Summary from lab journal of Explain section reading can be used to assess the misconceptions that still need to be addressed and/or what can be given as an extension for those students showing mastery for these learning targets. 	<p>Summative <i>What evidence of learning will demonstrate to you that a student has met the learning objectives?</i></p> <ol style="list-style-type: none"> 1. A rubric has been added to the teacher section found at the end of this document to assess student knowledge and understanding of the matter and its states and properties. 2. A teacher can create a summative test to assess student understanding of this standard.
<p style="text-align: center;">EXTENSION/ INTERVENTION (1 day or as needed)</p>	<p style="text-align: center;">EXTENSION</p> <ol style="list-style-type: none"> 1. Have students prepare their parts and perform "The Particles Visit Energyland," a Reader's Theatre to teach how energy moves through matter from <i>Primary Science Readers' Theatre</i> by Sharon Solomon, Pieces of Learning (2002). 	<p style="text-align: center;">INTERVENTION</p> <ol style="list-style-type: none"> 1. A scavenger hunt could be conducted throughout the building in which students keep a record in their science journals of the various liquids, gases and solids they locate. 2. The Resources section below lists books, videos, and websites that can be used to introduce or review the states and properties of matter to all learners. Some of the resources may be helpful to students who are having difficulty understanding the concepts
<p style="text-align: center;">COMMON MISCONCEPTIONS</p>	<p>Students often think that:</p> <ul style="list-style-type: none"> - Measurement is only linear. - Any quantity can be measured as accurately as you want. - Some objects cannot be measured because of their size or inaccessibility. - The five senses are infallible. - Gases are not matter because most are invisible. - Gases do not have mass. - Air and oxygen are the same gas. - Helium and hot air are the same gas. - Materials can only exhibit properties of one state of matter. - Melting/freezing and boiling/condensation are often understood only in terms of water. - Steam is visible water gas molecules. - Materials can only exhibit properties of one state of matter. 	

- Melting and dissolving are confused.
- Dew formed on the outside of glass comes from the inside of the glass.
- Gases are not matter because most are invisible.
- Weight and volume, which both describe an amount of matter, are the same property.
- Steam is water vapor over boiling water.

- One study showed that children, ages 5-13, tend to associate solids with rigid materials (Stavy & Stachel, 1984). They regard powders as liquids and any non-rigid materials, such as a sponge or a cloth, as being somewhere in between a solid and liquid (Driver, Squires, Rushworth & Wood-Robinson, 1994).
- Children can classify liquids more easily than they can solids, perhaps because liquids are less varied in their physical characteristics (Kind, 2004).
- Students' explanation of powders as liquids is often "because they can be poured." Reasons for non-rigid objects being neither solid nor liquid are because they "are soft," "crumble," or "can be torn." Children characterized the state of matter of a material according to its macroscopic appearance and behavior with the result that solids are associated with hardness, strength and an inability to bend (Driver et al., 1994).
- Students' understanding of boiling comes before their understanding of evaporation (Keeley, 2005). Driver (1994) states that from a sample of students ages 6-8, 70 percent understood that when water boils, vapor comes from it and that the vapor is made of water; the same students did not recognize that when a wet surface dries, the water turns to water vapor.
- Because students confuse heat and temperature as being the same, they believe that the longer something is heated, the hotter it gets and the boiling point increases the longer it is allowed to boil (Driver et al., 1994).
- Kind (2004) cites that students think matter has no permanent aspect. When matter disappears from sight (e.g., when sugar dissolves in water), it ceases to exist.
- Students often think of solids as matter, but not liquids and gases (AAAS, 1993).
- Kind (2004, p. 8) cites that children do not reason consistently. They may use sensory reasoning on some occasions and logical reasoning on others. Sensory experience dominates in cases where matter is not visible.

Strategies to address misconceptions:

Essential Science for Teachers: Physical Science: Session 1: Matter, a video on demand produced by Annenberg, explores the concept of matter with elementary children and teachers. The segment includes defining matter and exploring properties and states of matter. It incorporates interviews of children and classroom segments to identify common misconceptions and gives teaching strategies to address these misconceptions. Consider also using models, on-line simulations, and www.unitteststreaming.com video clips to address misconceptions.

<p style="text-align: center;">DIFFERENTIATION</p>	<p>Lower-Level: The teacher can assign groups having more difficulty with states of matter the collage for the Elaborate portion of this lesson. Some activities can be conducted as a whole class instead of smaller demo groups or partner groups if unable to work independently.</p> <p>Higher-Level: The teacher can assign the advanced students the lab demo portion of the Elaborate lesson. They can be encouraged to search on the Internet for different lessons than what has already been presented in class with the teacher. Consider assigning extension activities as needed.</p> <p>Strategies for meeting the needs of all learners including gifted students, English Language Learners (ELL) and students with disabilities can be found at the following sites: ELL Learners: http://www.ode.state.oh.us/GD/DocumentManagement/DocumentDownload.aspx?DocumentID=105521</p> <p>Gifted Learners: http://www.ode.state.oh.us/GD/DocumentManagement/DocumentDownload.aspx?DocumentID=105522</p> <p>Students with Disabilities: http://www.education.ohio.gov/GD/DocumentManagement/DocumentDownload.aspx?DocumentID=105523</p>
	<p>Websites:</p> <ul style="list-style-type: none"> • http://www.ehow.com/info_7902081_science-kids-3states-matter.html This website explores why a fundamental understanding of matter in its most basic states is necessary as a foundation for more complex science lessons. This site gives teacher background and other activities for comprehending the three basic states of matter. • http://www.betterlesson.com/lesson/42557/intro-to-states-of-matter Find quality lessons, lesson plans, and other resources for Third Grade Matter and its properties. • classroom.jc-schools.net/sci-units/matter.htm Contains lesson plans, topical sites, and interactive websites for students, as well as worksheets on various aspects of matter. • http://www.lessonplanet.com/search?keywords=properties+of+matter Contains lesson plans, worksheets, teacher background articles, presentations and videos which link to the Common Core Standards. <p>Discovery Ed:</p> <ul style="list-style-type: none"> • States of Matter 3:10 Understand how temperature affects the states of matter. • Common Properties of Matter: Atoms, Elements, and States 24:00 How the states of matter are alike and different and how they change. • States of Matter: Solid, Liquid, and Gas 2:09 The three states of matter are defined and it explains how they change. • The Language of Science: Physical Science 3 – 5: Matter 24:03 Identifies core physical science vocabulary for upper-elementary students. *****Also available in Spanish version.

- Science Lab: Matter - Watch videos, review vocabulary with an interactive, talking illustration, or do a simulation to take water through its different states.
- Lodge McCammon Songs: Shake: Solids, Liquids, and Gases 3:44 Introduces the states of matter cycle by revealing how water particles react as they are heated or cooled.
- Solids, liquids, and Gases 21:00 Solids, liquids and gases are states of matter which exist all around us in our environment. Contains experiments demonstrated by students.
- Matter Changes 2:30 Reveals how matter can change between states by either heating or cooling. ***** Also available in Spanish.
- Review: Matter 3:18 Recaps the key vocabulary words that were shared throughout the program. *****Also available in Spanish.
- Theme and Introduction :43
-Discover a song to remember the definition of matter and the forms it takes.
- Review 1:01 Sydney and the chef review the forms and properties of matter.
- Gases 1:51 Discover how liquids differ from solids.
- Three Types of Matter: An Introduction 1:18 Everything is made of matter. Matter can be a solid, liquid or a gas. Matter has characteristics and matter can change states.

Literature:

- *Bartholomew and the Oobleck* by Dr. Seuss. Random House, New York, 1949. A king orders his royal magicians to cause something new to rain down from the sky. But when the green gooey material "Oobleck" falls onto the kingdom, its strange properties cause quite a mess until the king learns some humility.
- *Einstein Anderson, Science Sleuth* by Seymour Simon; illustrated by Fred Winkowski. Viking Press, New York, 1980. In the "Universal Solvent," Einstein Anderson's friend Stanley tries to convince him that the cherry soda-looking liquid he has invented will dissolve anything. Einstein's knowledge of the properties of solvents leads him to unravel this mystery.
- *Elliot's Extraordinary Cookbook* by Christina Bjork; illustrated by Lena Anderson. Farrar, Straus & Giroux, New York, 1990. With the help of his upstairs neighbor, Elliot cooks wonderful foods and investigates what's healthy and what's not so healthy. He finds out about proteins, carbohydrates, and the workings of the small intestine. He learns about the history of chickens and how cows produce milk. His friend shows him how to grown bean sprouts, and he sews an apron. Nice real-life connection to the ways that cooking, by combining many substances at varying temperatures, is an exploration of matter and its properties.
- *Hot-Air Henry* by Mary Calhoun; illustrated by Erick Ingraham. William Morrow, New York, 1981. Henry, a spunky Siamese cat, stows away on a hot air balloon and accidentally gets a solo flight. He learns that there is more to ballooning than just watching as he deals with air currents, power lines, and manipulating the gas burner. Shows practical use of a gas and how changing the temperature of a gas changes its properties.

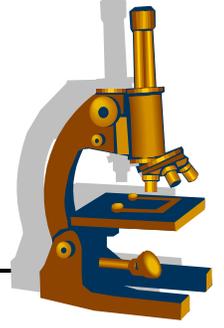
- *The Slimy Book* by Babette Cole. Random House, New York, 1986. Lighthearted look at slime in all its “sticky, sludgy, slippery, sloppy, ploppy, creepy kind” and where it may be found: around the house, in invertebrate creatures, in foods, and maybe even outer space. Nice way to model good descriptive language of the properties of an intriguing form of matter.
- *The Snowy Day* by Ezra Jack Keats. Viking Press, New York, 1962. Peter goes for a walk on a snowy day. He makes different patterns in the snow with his feet, a stick, and then his whole body. He tries to save a snowball in his pocket but is disappointed when it melts. That night Peter dreams that the sun melted all the snow outside, but when he wakes up, it’s snowing again! Good example of phase change of matter (snow to water).
- *Water’s Way* by Lisa W. Peters; illustrated by Ted Rand. Arcade Publishing/Little, Brown & Co., Boston, 1991. “Water has a way of changing” inside and outside Tony’s house, from clouds to steam to fog and other forms. Innovative illustrations show the changes in the weather outside while highlighting water changes inside the house.

Teaching Guide Books:

- *Teaching Science with Foldables* by Dinah Zike. How to make foldables that make science accessible for all students using reading and study-skill strategies.
- *Water Science: Overflowing with Facts, Stories and 40 Water Projects* by Deborah Seed (1992). Discusses the functions, properties, and vital importance of water in our lives and examines what water hazards we face as we misuse or pollute it. Includes water games and tricks.

Name _____ Date _____

EXPERIMENT FORM



Hypothesis:

PROCEDURE

Materials:

Directions:

RESULTS:

CONCLUSION:

Explore (Day 4) - Teacher Page – Properties of Matter Centers

The following centers can be set up for students to explore the properties of matter. Each concept is listed in parentheses on this page. The centers contain short activities that can be completed within a 5-minute time span. Each center should contain a card/poster of center directions and the needed materials. The teacher will assist the students as needed as they participate in the centers. When the centers are completed, the teacher will conduct a mini-Explain session with the class. During this session, student observations will be reviewed, vocabulary and concepts introduced, and misconceptions clarified.

Center #1

(Liquids and solids do not compress into smaller volume as easily as gases.)



Center directions: There are 3 syringes used in this center. One syringe contains air (a gas), one syringe contains water (a liquid), and one syringe contains sand (a solid). Push on the plunger of each syringe. Try to squeeze the volume of the air, water, and sand as small as possible.

Teacher Notes: When setting up this exploration, be certain to choose syringes without a needle. Plug the holes of the syringes with tape or clay so that the “matter” does not squirt out. Each syringe should be filled halfway with the air, water, or sand. If multiple syringes are available, other examples of solids and liquids could be included.

Explain: When the students were pushing in the plunger, they were attempting to compress (press, squeeze, or minimize) the gas, liquid, and solid so that it would have a smaller volume, or take up less space. Note which state of matter is easiest to compress and which is most challenging. Ask the students to explain the reasoning behind their conclusions. Why is one state of matter easier to compress than the others?

The www.chem4kids.com website contains background information on compression and states of matter. Click the Matter link and then choose Solids, Liquids, and Gases (separate links on the right side of the page) for further information about the state and its ability to be compressed.

Center #2

(Liquids and gases flow easily, but solids do not flow easily.)

Center directions: Put some cubes or small blocks in a container and pour them into the tub. Do they flow easily? Try other solid objects.

Pour the water into the empty container. Does the water flow easily? Try pouring the other liquids into the other empty containers.

Teacher Notes: Provide students with small blocks or cubes and other small solids that could be poured from a container. Label a container (or more) SOLIDS so that the students know to use it for the solid objects. Two containers should be labeled WATER and one should be partially filled with water. (The other is used to collect the poured water so the containers stay "pure" to their liquids. Other containers can be similarly labeled and filled with other liquids to demonstrate the difference in flow.

Explain: The students should observe that liquids flow easily, while solids do not. Solids can be poured, but they do not flow. The smaller particles of a liquid move around each other slowly to create a flow while the particles of a solid stick tightly together and do not flow. Demonstrate that by pouring sand, salt, or sugar from one container to another it appears to "pour." However, it is still a solid. Allow the students to hold some in their hand and observe it with a magnifying lens. Explain that each tiny piece is a solid.

Center #3

(Solids retain their shape and volume unless a force is applied.)

Center directions: Handle (hold and touch) the solids in this center. What do you notice about these solids? Do they change shape or volume (amount of space)?

Apply force (press) on the solid. Does it change shape when you press on it? Can it return to its original shape?

Teacher Notes: Students can explore various solids (ie. by touching, holding, squeezing, etc.) within the center. Students should be provided with objects that are very rigid (a book, a pencil) and somewhat malleable (a pillow, stuffed animal, plastic bottle). Clay can also be provided so that the children can manipulate a solid, while still being able to return it to its original form. They can apply force to the clay to change its shape. A tray of sand can also be used to explore changes in solids with the application of force.

Explain: Students should observe that most solids retain their shape or can regain their shape over time and with manipulation (ie. the clay and sand). It takes force (pushing and pulling) for the solid to change shape and volume. All solids are not hard and rigid. Some solids, such as a pillow, can bend.

Center #4

(Liquids assume the shape of the part of the container that it occupies, retaining its volume.)

Center directions: There are beakers of liquid in the center. Pour the liquid of one beaker into an empty container. Did the shape of the liquid change when the container changed? Pour the liquid back into the

beaker and measure the volume. Did the volume of the liquid change? Try pouring the liquid into other containers and observe any changes.

Teacher Notes: The center should house plastic containers of various shapes and sizes, as well as beakers for measuring the volume of the liquid. Water can be the liquid of choice.

Explain: The students should determine that the liquid will take the shape of its container. However, the volume of the liquid will not change. The liquid will simply spread out in different directions to fill the part of the container that it occupies. Consider a liquid spill on the floor – the liquid will spread on the floor since there is no container to “contain” the liquid.

Center #5

(Gases assume the shape and volume of its container.)

Center directions: Choose 2 different balloons. Blow air into the balloons, filling them up as much as possible. Do not put your mouth on another child’s balloon! Do not put too much air into the balloon and pop it! Tie the balloons or put a paper clip at the bottom of each balloon to hold the air. Are the air-filled balloons the same shape? Do they take up the same amount of space?

Teacher Notes: It is helpful to have balloons of different sizes and shapes so the students can observe the differences in shape and volume of gases. Plastic bags and gloves can be used if available and to also show the differences. For safety reasons, do not allow the students to keep the balloons – all balloons must be thrown away.

Explain: Gases are difficult to observe since they are normally clear. When students fill a balloon with air, they can observe that the air (gas) is causing the balloon to change shape and take up more space. If they let the air out of the balloon, they can observe that it will deflate. The air is no longer taking up space in the balloon, filling it up.

ACTIVITY SHEET

“WHY MATTER MATTERS”

Name _____

Draw water as a solid, a liquid and a gas.

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water as a solid

water as a liquid

water as a gas

First, when the water was a solid it was called _____

Then, it changed to a liquid because _____

After that, it changed into a gas because _____

So, the reason water can change to another form of matter is because

“WHY MATTER MATTERS”

A play to teach the forms of matter by Sharon Solomon

Characters

Miss Matter, the teacher Narrator Team 1 Team 2 The Class

Vocabulary

condense, evaporate, freeze, heat, matter, melt, texture, water vapor

Scene One

Vaportown Elementary School

Narrator: Miss Matter is teaching a science lesson about solids, liquids, and gases.

Teacher: Class, as you know, we have been studying about matter. Matter is anything that takes up space, such as solids, liquids and gases. To practice for our quiz, I’m going to ask you some questions. Just answer true or false. Ready?

Class: Yes, Miss Matter.

Teacher: Question number 1: Solid matter does NOT change shape or size.

Class: True.

Teacher: Good! Question number 2: Liquids, gases and solids all have texture.

Class: True- er- false-huh?

Teacher: I see you’re not too sure about that one. Texture is the way something feels. Gas doesn’t have a texture, but solids and liquids have texture. Question number 3: Liquids change shape depending on the shape of their container.

Class: True.

Teacher: Very good! Question number 4: All liquids feel alike.

Class: False.

Teacher: Right! Milk and oil have very different textures. Question number 5: Air is a gas that is all around us.

Class: False-er-true-huh?

Teacher: It is TRUE that air is a gas and that it IS all around us. We just can't see it. Here's another one. Question number 6: Air takes up space.

Class: True.

Teacher: I'm glad you remember how air fills balloons and plastic bags. I'm proud of you. Just one more question: Matter can change from liquid to gas or from gas to liquid.

Class: Er-false-true-huh?

Teacher: Last weekend the water in the glass evaporated. That means the water became a gas or became water vapor. That is liquid turning into gas. Remember?

Class: Yes, Miss Matter.

Teacher: Rain is just water vapor being cooled in the air and changing into liquid. That's called condensing. Bet you can't say condensing three times fast.

Class: Condensing, condensing, condensing!

Teacher: Let's divide into two teams. We'll go outside on a Matter Hunt. Each team needs to find one solid, one liquid, and one gas. Whichever team does it first correctly will be the winner. Bring containers with you. All set?

Class: You bet!

Narrator: The class follows Miss Matter outside to begin the Matter Hunt.

Scene Two On the playground

Team 1: Let's go behind the school away from the swings so we can keep our matter a secret.

Team 2: We'll go over by the jungle gym. Let's talk quietly so Team One won't hear us.

Narrator: Each team begins exploring.

Team 1: Here's a branch that fell from the maple tree. It's a solid.

Team 2: There's a melted crayon on the blacktop. Now that it cooled off, it's a solid again.

Narrator: It begins to rain.

Teacher: Hurry, class! The condensed water vapor is falling on our heads!

Team 2: Quick! Put the bowl on the ground to catch the rain water. Let's go hunt for a gas.

Team 1: Here's some water in a puddle. We'll collect it in this container. Hurry and look for a gas.

Narrator: Just then Team 2 remembered that Billy's bicycle tires had air in them, so he ran to get his bicycle.

Team 2: Miss Matter, we have air in the bicycle tires, a crayon and rainwater. That's a gas, a solid and a liquid.

Teacher: Team 1, what do you have?

Team 1: We have a tree branch for a solid and water for a liquid. We didn't find a gas.

Teacher: Air is a gas that is all around us. Well, it looks like Team 2 wins. Let's go back inside. We're getting wet.

Scene Three

Back in the classroom

Narrator: The wet students return, carrying all their matter.

Teacher: We can have a special treat tomorrow. Team 2 can pick their favorite solids, liquids and gases.

Team 2: We want apple juice for the liquid. We'll eat soft pretzels for the solids. We'd like ice cream, too. That's a frozen liquid, but now it's a solid. We'll decorate with balloons for the gas.

Narrator: Each team made decorations from solid matter.

Team 1: This is fun, even if our team didn't win.

Teacher: Class, I have a special song for you about matter.

Class: Hooray!

(To the tune of "You Are My Sunshine")

You are my solid, you never change shape,

You have texture, color and size.

You'll stay a solid unless you're heated.

So please stay a solid, that's wise.

You are a liquid, and you have texture,

You can be solid if you freeze.

You come in colors and your shape changes,

So stay a liquid, won't you please?

You are a gas and we can't see you,

You change to liquids when you cool.

You can fill bubbles, balls and balloons,

So please stay a gas, THAT'S COOL!!

Teacher: Well, class, now you know why matter matters!

TEACHER ANSWER KEY FOR
ACTIVITY SHEET
“WHY MATTER MATTERS”

Name _____

Draw water as a solid, a liquid and a gas.

(drawing should resemble ice or snow)	(drawing should resemble water in a stream, drop, etc)	(drawing should resemble steam, vapor, etc.)
---------------------------------------	--	--

water as a solid

water as a liquid

water as a gas

First when the water was a solid it was called ICE or SNOW

Then it changed to a liquid because Heat was added

After that, it changed into a gas because Additional heat was added

So, the reason water can change to another form of matter is because

There is an addition or reduction of heat

MATTER CHANT

Adapted from Web lesson written by Mary Coughlin and Carolyn Bradley

http://www.coreknowledge.org/mimik_uploads/lessons_plans/480/Matter/%20Matters%20Solids%20L

Hop on board the Science Train
And you can exercise your brain.
Head on down the winding track.
Don't waste time looking back.

Solids, liquids, gases, too
We know about them. How about you?
Listen to us, you'll learn a lot.
Like what happens to a liquid when it gets hot.

Solids you can really see,
Like all the tables and a tree.
Solids keep their size and shape,
Like books and pens and rolls of tape.

A liquid's shape depends on what it is in,
Like glasses, bottles, pans, or a tin.
Make a liquid very hot
And a gas is what you have got.

Gas is matter you can not see.
The air is good for you and me.
Helium, oxygen, hydrogen, too,
We can name them and so can you.

We have learned a lot upon this train.
We really exercised our brain.
Now our ride has come to an end.
We hope to present to you again.

Teacher Rubric for Grading Elaboration Products

	Science Content	Science Vocabulary	Effort/Collaboration
4 – Effective	<ul style="list-style-type: none"> • Clearly explains the three states of matter and thoroughly expands on the properties of each. Terms such as compressibility, shape, heat, cooling are used appropriately. • Answers all questions correctly 	<ul style="list-style-type: none"> • Consistently uses appropriate science language and terminology 	<ul style="list-style-type: none"> • Works well with all the group members • Actively participates in the process and the final product • Stays on task throughout the entire planning and presentation periods
3 – Adequate	<ul style="list-style-type: none"> • States some of the properties of the three states of matter • Answers most questions correctly 	<ul style="list-style-type: none"> • Uses mostly appropriate science language and terminology 	<ul style="list-style-type: none"> • Works well with most members of the group • Participates in most of the process and the final product • Stays on task some of the period
2 – Partial	<ul style="list-style-type: none"> • Partially addresses some of the properties of the three states of matter • Cannot answer other's questions 	<ul style="list-style-type: none"> • Displays partial use of appropriate science language and terminology 	<ul style="list-style-type: none"> • Works with some of the group members • Participates in some of the process and the final product • Needs to be reminded to stay on task
1 – Minimal	<ul style="list-style-type: none"> • Minimally addresses some of the properties of the three states of matter 	<ul style="list-style-type: none"> • Displays minimal use of appropriate science language and terminology 	<ul style="list-style-type: none"> • Minimally works with the group • Little to no evidence of participation in the process and final product • Does not stay on task

Related COMMON CORE ELA STATE STANDARDS:

Key Ideas and Details

CCSS.ELA-Literacy.RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

CCSS.ELA-Literacy.RI.3.2 Determine the main idea of a text: recount the key details and explain how they support the text.

CCSS.ELA-Literacy.RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

Craft and Structure

CCSS.ELA-Literacy.RI.3.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area.

CCSS.ELA-Literacy.RI.3.5 Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently.

Integration of Knowledge and Ideas

CCSS.ELA-Literacy.RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).

CCSS.ELA-Literacy.RI.3.8 Describe the logical connection between particular sentences and paragraphs in a text (e.g., comparison, cause/effect, first/second/third in a sequence).

Range of Reading and Level of Text Complexity

CCSS.ELA-Literacy.RI.3.10 By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, at the high end of the grades 2–3 text complexity band independently and proficiently.

Writing

CCSS.ELA-Literacy.W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

CCSS.ELA-Literacy.W.3.2a Introduce a topic and group related information together; include illustrations when useful to aiding comprehension.

CCSS.ELA-Literacy.W.3.2b Develop the topic with facts, definitions, and details.

CCSS.ELA-Literacy.W.3.2c Use linking words and phrases (e.g., also, another, and, more, but) to connect ideas within categories of information.

CCSS.ELA-Literacy.W.3.2d Provide a concluding statement or section.

Range of Writing

CCSS.ELA-Literacy.W.3.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

CCSS.ELA-Literacy.W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

CCSS.ELA-Literacy.W.3.2a Introduce a topic and group related information together; include illustrations when useful to aiding comprehension.

CCSS.ELA-Literacy.W.3.2b Develop the topic with facts, definitions, and details.

CCSS.ELA-Literacy.W.3.2c Use linking words and phrases (e.g., because, therefore, since, for example) to connect opinion and reasons.

CCSS.ELA-Literacy.W.3.2d Provide a concluding statement or section.

Speaking and Listening:

Comprehension and Collaboration

CCSS.ELA-Literacy.SL.3.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.

CCSS.ELA-Literacy.SL.3.1a Come to discussions prepared having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.

CCSS.ELA-Literacy.SL.3.1b Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).

CCSS.ELA-Literacy.SL.3.1c Ask questions to check understanding of information presented, stay on topic, and link their comments to the remarks of others.

CCSS.ELA-Literacy.SL.3.1d Explain their own ideas and understanding in light of the discussion.

CCSS.ELA-Literacy.SL.3.2 Determine the main ideas and supporting details of a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.

CCSS.ELA-Literacy.SL.3.3 Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.

CC.SS.ELA-Literacy.SL.3.5 With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing.

CC.SS.ELA-Literacy.SL.3.7 Conduct short research projects that build knowledge about a topic.

Presentation of Knowledge and Ideas

CCSS.ELA-Literacy.SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.

CCSS.ELA-Literacy.SL.3.6 Speak in complete sentences when appropriate to task and situation in order to provide requested detail or clarification. (See grade 3 Language standards 1 and 3 here for specific expectations.)

***For more information:** http://www.corestandards.org/assets/CCSSI_ELA%20Standards.pdf