

Matter for Minors

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Grade Level: K-3

Time Allotment: 1.5 hours or 3- 30 minute sessions

Overview: Through streaming videos, web sites, and hands on activities students will develop an understanding of what matter is made. The focus will be on how temperature can affect matter and what the particles look like in the states of matter.

Subject Matter: Elementary Science

Learning Objectives:

The students will:

- Identify characteristics of solids, liquids and gases
- Demonstrate how temperature can affect the state of matter
- Identify what matter is made of (particles)

Standards:

This lesson addresses the Standards of Learning for the state of Virginia. These SOLs can be found at <http://www.pen.k12.va.us>

- K.4 The student will investigate and understand that the position, motion, and physical properties of an object can be described. Key concepts include
- a) colors (red, orange, yellow, green, blue, purple), white, and black;
 - b) shapes (circle, triangle, square, and rectangle) and forms (flexible/stiff, straight/curved);
 - c) textures (rough/smooth) and feel (hard/soft);
 - d) relative size and weight (big/little, large/small, heavy/light, wide/thin, long/short); and
 - e) position (over/under, in/out, above/below, left/right) and speed (fast/slow).
- K.5 The student will investigate and understand that water flows and has properties that can be observed and tested. Key concepts include
- a) water occurs in different states (solid, liquid, gas);
 - b) the natural flow of water is downhill; and
 - c) some materials float in water, while others sink.
- 1.3 The student will investigate and understand how different common materials interact with water. Key concepts include
- a) some liquids will separate when mixed with water, but others will not;
 - b) some common solids will dissolve in water, but others will not; and
 - c) some substances will dissolve more readily in hot water than in cold water.
- 2.3 The student will investigate and understand basic properties of solids, liquids, and gases. Key concepts include
- a) mass and volume; and
 - b) processes involved with changes in matter from one state to another (condensation, evaporation, melting, and freezing).
- 3.3 The student will investigate and understand that objects are made of materials that can be described by their physical properties. Key concepts include
- a) objects are made of one or more materials;
 - b) materials are composed of parts that are too small to be seen without magnification; and
 - c) physical properties remain the same as the material is reduced in size.

Media Components:

- Streaming Video:
Properties of Matter, Part 2: Liquids, Solids and Gases This is a United Streaming Video which can be found at www.unitedstreaming.com
- Smart Board Flash File: “Changes of State”. In the gallery search “flash”.
- Web Sites:
“BBC Science Clips for kids, Virtual Experiments”
http://www.bbc.co.uk/schools/scienceclips/ages/8_9/solid_liquids.shtml can be used to show the affects of temperature on different kinds of matter

“Harcourt School, States of Matter”
http://www.harcourtschool.com/activity/states_of_matter/ This site has a virtual example of how the particles move in the three forms of matter.

Materials:

For Introductory Activity:

- Clay, approximately $\frac{1}{4}$ cup for each child
- Plastic baggies

For Learning Activities

- Internet access
- Smart Board (desirable) LCD projector or presentation device to display internet
- Poster, prepared Smart Board slide, or power point slide with Particle Dance
- Lap tops or computer lab access

For Culminating Activity:

- For Book: paper with space at top and lines at the bottom, crayons, markers
- Option: scanner or digital camera, access to Photo Story

Preparations for Teacher:

- The teacher should preview and download the digital clip from United Streaming or burn it on a disc.
- Web sites should be previewed for familiarity and be bookmarked for efficient transitions.
- Place $\frac{1}{8}$ cup of clay in snack size baggie for each student.
- Paper for culminating activity

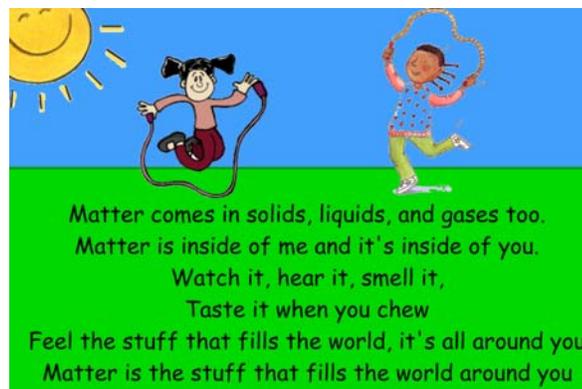
Introductory Activity: (15-20 minutes)

1. Give each child a baggie containing clay.
2. Instruct children to shape the clay.
3. **Ask** probing questions such as.... How did you change the shape? Do you have the same amount of clay? Is it still clay? Can you push into it?
4. **Say:** “We can change the shape of the clay but it is the same amount of clay. It will hold its shape until something else is done to change it. Do you ever wonder what makes clay stick together? Or why water doesn't crumble? If everything in the world is made of matter, what is matter made of?” Accept thoughts and wonders.

Learning Activities:

Streaming digital video:

1. **Say:** “Students, this clip will remind us of the kinds of matter in our world. We are going to watch the first part, and then I will stop the video. In this first part a girl is singing a jump rope rhyme to help her remember the three different kinds of matter. See if you can remember all three and what she says we can do with it” Begin the clip, “Forms of Matter” at 1:00. **Stop** the clip after the girl jumps rope (01:18). Ask volunteers to name the three states of matter in her rhyme. (solid, liquid, gas) Then ask the whole group to say them together. Most will not have been able to catch the five senses the first time through. Rewind the clip and play it again. **Say:** “Those were hard to catch the first time, let's listen again, and see if we can catch what she says you can do with matter.” Option: Type up the words to the chant and display them for this second time and for a future sing along.



Jump Rope Rhyme from United Streaming Video Matter, Part 2

2. **Advance** the video to 3:30 **Say:** “In this section the chef is going to tell you about some different forms of matter and what the building blocks of matter are. Listen to find out what all matter is made of.” **Play** clip. **Stop** the clip after the chef stacks the blocks. (04:24)

3. **Ask:** “What did he say all matter is made of?” (Answer: Particles) **Say:** “Everything you see and some things you don’t are matter. Matter is everywhere and it is made up of tiny particles.”
4. **Advance** the video to 06:36 **Say:** “We are going to look at three more clips. One for each of the states of matter: solid, liquid, and gas. The first one is about solids. Watch and listen for what the particles are like in solids.” **Start** video clip. (06:36)
5. **Pause** the clip after the chef sets the container with blocks on the table and says “... they have very little room to move”. (07:02) **Say:** “What do you notice about the blocks in the jar?” (Answer: the particles are tightly packed together and have very little room to move.)
6. **Advance** to the liquid segment. (7:58) **Say:** “Liquids also have particles, but their particles are different. Listen to this next segment to find out how the particles in liquids are different from those in solids.”
7. **Stop** when containers of blocks are displayed. (08:08) **Ask:** “How are the particles in liquids different from solids?” (Answer: The particles in liquids are further apart than the particles in solids. There is more space between them) **Start** the clip again from this spot. **Say:** “Now watch to see how the particles flow and what is special about the particles in liquid.” **Pause** the clip after the particles flow from the pitcher. (8:41) **Say:** “What did you notice about the particles?” (Answer: The particles tumbled over each other)
8. **Say:** “In this final segment we will learn about the particles in our last form of matter, gas. Let’s listen and find out what these particles are like.” **Advance** clip to 9:49 and play. **Stop** the clip after the blocks in the glass container is shown. (10:51) **Ask:** “What do the particles in gas look like?” (Answer: The particles are very spread out. They take up all the space.)
9. Access Smart Board Flash file— “Changes of State”. **Say:** “Now let’s look at how temperature can change the particles in matter.” Demonstrate how the temperature on the thermometer can be raised and lowered. **Ask:** “What do you notice?” Wait for answers. **Say:** “Yes, when the temperature rises the particles move faster and faster and when it is lowered the particles move slower and slower and when they get very cold they almost stop moving.”
If you do not have access to Smart board software this web site http://www.harcourtschool.com/activity/states_of_matter/ is a good addition or alternative to demonstrate the movement of particles in matter.

10. Chant: **Say:** “Let’s learn a chant to help us remember what we have learned so far.”

THE PARTICLE DANCE

Hey, hey it’s the particle dance
Hey, hey it’s the particle dance
(Snap fingers)

I am solid I quiver and shake
Quiver and shake, quiver and shake
(put arms straight down by side and wiggle, a bit)

Hey, hey it’s the particle dance
Hey, hey it’s the particle dance
(snap)

I am liquid I pour and flow
Pour and flow, pour and flow
(use hands and arm to make a flowing motion)

Hey, hey it’s the particle dance
Hey, hey it’s the particle dance
(snap)

I am gas I pop and fly
Pop and fly, pop and fly
(tap shoulder and “fly” hands into the air)

Hey, hey it’s the particle dance
Hey, hey it’s the particle dance
(snap)

11. Interactive web site: BBC- School Science Clips

http://www.bbc.co.uk/schools/scienceclips/ages/8_9/solid_liquids.shtml

Navigate to the web site using a Smart board, LCD projector or other display device. This web site is a virtual lab that tests the affect temperature has on matter. Students will click on the red button to “heat” the object and the blue button to “cool” the object. Students will also be able to simulate a shake or wobble test on the beaker by clicking on the “test” button. The speaker button in the text box will read the directions to the students who need that support. The teacher should demonstrate the first simulation with the chocolate bar as a whole group. Students may continue the remaining simulations in a lab setting or using a class set of lap tops.

Say: “Now you are going to get a chance to do some virtual experiments on your own computers. On this web site you will be able to see what happens to solids, liquids and gases when the temperature changes. Let’s do the first simulation with a chocolate bar together.”

Culminating Activity: Make a Book/Digital Story

Student will make pages for a class book by drawing a picture of a form of matter and writing sentences about their picture. The sentences should state what form of matter they drew and describe what the particles would be doing in that form of matter.

1. Using a chart similar to the one below, have students brainstorm the information that they have learned.

Let's make a book!

First, let's remember some characteristics of the particles in each kind of matter



 SOLIDS	 LIQUIDS	 GASES
lion block popcicle train	coke water shampoo lotion	air helium oxygen
tightly packed wiggle in place don't move much	flow pour	float fly off to fill space spread out

2. Give students paper that has writing lines at the bottom and drawing space at the top. **Say:** “In the space at the top of your paper, I want you to draw a picture of a solid, liquid or gas. Raise your hand if you would like to draw something that is a gas or holds a gas? How about a liquid? A solid?” Make sure that you have volunteers for all the forms of matter.
3. After they have drawn their picture, **Say:** Now, you are going to write two or more sentences about your picture on the lines at the bottom of your page. Use the chart that we made earlier to help you write each sentence. Let’s do one together. If I drew a picture of a lion I might write, A lion is a solid. Its particles are tightly packed together and don’t move very much.” (Other ex. Pepsi is a liquid. Its particles can pour and flow. Air is a gas. Its particles spread out to fill up all the space.)
4. Pages are scanned or photographed with a digital camera and imported into Photo Story. The students’ voices are recorded reading their page. The finished product can be played back from projection equipment, digital video players or classroom web sites. The pages are laminated and added to the classroom library. These can be used as review or to help a struggling student.

Extensions:

Cross-Curricular Extensions

Language Arts:

- *What is the World Made Of? All About Solids, Liquids, and Gases* by Kathleen Weidner Zoehfeld
- *Bartholomew and the Oobleck* by Dr. Seuss

Math:

- SMARTBoard Temperature flash file: Change of State: Water
- Reading a thermometer.

Art:

- Crayon melts: Melt chunks of crayons between wax paper with an iron. It gives a stained glass affect.

Music/Poetry:

- Song "What is Matter"

What is Matter?
(Tune: Three Blind Mice)
What is Matter? What is Matter?
A Solid, Liquid, or Gas
A Solid, Liquid, or Gas

It takes up space and it weighs something too!
It's everywhere that includes me and you.
Did you every think such a thing could be true?
That is Matter. That is Matter.

Science:

- Make a chart of rules so that they can test materials around the room.
 1. Push test -- can you push into it?
 2. Pick up test -- if you pick some up, does it all come up?
 3. Pour test -- does it pour out smoothly, or does it just fall out in a clump?
 4. Shape test -- does it keep the same shape?
- Lab tests of how some solids and liquids mix with warm/cold water
- Oobleck for each child and place in baggies:
¼ cup of corn starch 1/8 cup of water
Background information for Teacher: Oobleck is a non-Newtonian fluid. This means that when a small amount of force is used, it acts like a liquid, but when more force is applied, it acts like a solid. For instance, one can slowly put a spoon in Oobleck, but it is impossible to stir it quickly. When you quickly squeeze or roll the Oobleck in your hand it will form a hard ball from the pressure of your fist; but when the pressure is released, it will seem to "melt" into a liquid again.

So is it a solid or a liquid? Actually, in a way, it is both. A non-newtonian liquid means that it is a liquid that doesn't follow Newton's equations for liquids under pressure.

Technology:

- SMARTBoard Notebook software: Venn Diagram: solids, liquids and gas.
- Smart Board Flash files: solids, liquids, gases
- Harcourtschool http://www.harcourtschool.com/activity/states_of_matter/
- Chem 4 Kids: http://www.chem4kids.com/files/matter_states.html
- What's The Matter? <http://galaxy.net/~k12/matter/phases.shtml>

Community Extensions:

- Invite a weather man to visit and discuss the different types of precipitation and its state of matter.
- Invite speaker from the chemistry department from Radford University to demonstrate concepts of matter.