

Structure and Transformation of Matter Original (2008) Lesson Plan

I can classify matter into different categories.

I can describe the differences between solid, liquid, and gas.

Lesson 1: Search for Matter

Procedures:

1. Take students on a “Matter Search” using worksheet
2. Hand out worksheet about the properties of matter
3. Watch video *All About Solids, Liquids, & Gases*. Watch first eight minutes.
4. Briefly discuss ways to classify matter (solid, liquid, gas)
5. Review vocabulary for solid, liquid, and gas using overhead and give examples of each: gas: air, smoke; solid: ice, desk, bookshelf, pencil; liquid: water, oil, juice
6. Demonstration of the states of matter using students (p. 45: *Science Is. . . . A source book of fascinating facts, projects, and activities*)

Vocabulary:

Atoms: tiny particles that form all matter.

Solid: A solid is anything that takes up space and has mass. A solid has a definite shape and volume.

Liquid: A liquid has definite volume but takes on the shape of its container.

Gas: Gas does not have a definite shape or volume.

Physical property: A physical property of matter is anything that can be observed about the matter using your five senses.

Sources:

Harcourt Science Book

Bosak, S. *Science Is. . . .* 2000. Canada; Scholastic Press.

All About Solids, Liquids, & Gases. Schlessinger Science Library. 2004. Wynnewood

Revised Lesson Plan Using ISTE Student Standards to Integrate Technology Structure and Transformation of Matter (original date: 2008)

Structure and Transformation of Matter Lesson Plan (Revised)

I can classify matter into different categories.

I can describe the differences between solid, liquid, gas, and plasma.

Lesson 1: Search for Matter

Procedures:

ISTE Standard 1:

Communication and Collaboration

Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.

ISTE Standard 2:

Communication and Collaboration

Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.

ISTE Standard 3:

Research and information fluency

Students apply digital tools to gather, evaluate, and use information.

Hand out the iPads. Have students log into Edmodo

1. Have students take Structure and Transformation of Matter Pretest using Edmodo's quiz feature.
2. Divide students into groups of 4. Have them pick a number out of a paper bag.
3. The numbers are labeled 1 (Solid), 2 (Liquid), 3 (Gas), 4 (Plasma). When the students have their "state of matter" refer them to the following websites:

<http://www.sciencekids.co.nz/gamesactivities/gases.html>

<http://studyjams.scholastic.com/studyjams/jams/science/matter/solids-liquids-gases.htm>

http://www.chem4kids.com/files/matter_plasma.html

4. Students will then work with their groups and watch the Study Jams video and listen do the activity to identify the properties of matter and what allows matter to change from one state to another.

2 (5). Take students on a "Matter Search" using worksheet (Have groups go on a matter search for their particular state of matter in the classroom writing down as many items as possible)

3 (6). Hand out worksheet about the properties of matter (Have students create their own information sheet about properties of their matter, and exchange it with another group).

4(7). Watch video *All About Solids, Liquids, & Gases*. Watch first eight minutes.

5(8). Briefly discuss ways to classify matter (solid, liquid, gas, plasma) (Have student groups create a post on Edmodo for the rest of the class about their particular state of

matter explaining what it is and examples of their state of matter—solid-bookshelf, liquid-water coming out of the faucet, water in a bottle, gas-air in the classroom, plasma-florescent light bulbs)

6. Review vocabulary for solid, liquid, and gas using overhead and give examples of each: gas: air, smoke; solid: ice, desk, bookshelf, pencil; liquid: water, oil, juice (Skip, Step 8 above allows for students to review their own vocabulary words).

7(9). Demonstration of the states of matter using students (p. 45: *Science Is. . . . A source book of fascinating facts, projects, and activities*-Students represent the molecules or atoms in each state of matter. As a solid they are packed really close together with very little room. As a liquid they are farther apart and spread out to fill the shape of the object they are occupying. As a gas, they are spread out to the four corners of the room and fill up the space of the structure they are occupying. As plasma would be the individual small groups gathered around a central person and moving around the room).

10. Using the iPads, have students go to the following website: <http://www.wordcentral.com/> and look up the definitions of the vocabulary words. Students can then go individually to <http://www.brainpopjr.com/games/mattersorter/> to review what they have learned.

Students do an exit slip by means of Edmodo's "Poll" feature. They can pick between two statements:

1. Matter has three states of form.
2. Matter has four states of form.

Vocabulary:

Atoms: tiny particles that form all matter.

Solid: A solid is anything that takes up space and has mass. A solid has a definite shape and volume.

Liquid: A liquid has definite volume but takes on the shape of its container.

Gas: Gas does not have a definite shape or volume.

Physical property: A physical property of matter is anything that can be observed about the matter using your five senses.

Plasma: Plasma is similar to gas but it is made of particles with a positive or negative charge created by a magnetic field.

Electron: An electron is a negatively charged particle that travels around a neutron.

Nucleus: A nucleus is a central point that other atoms travel around.

Sources:

Harcourt Science Book

Bosak, S. *Science Is. . . .* 2000. Canada; Scholastic Press.

All About Solids, Liquids, & Gases. Schlessinger Science Library. 2004. Wynnewood

Technology

Apple iPad 2

Websites:

<http://www.sciencekids.co.nz/gamesactivities/gases.html>

<http://studyjams.scholastic.com/studyjams/jams/science/matter/solids-liquids-gases.htm>

<http://www.brainpopjr.com/games/mattersorter/>

http://www.chem4kids.com/files/matter_plasma.html

<http://www.wordcentral.com/>

<http://faculty.mwsu.edu/west/maryann.coe/coe/inquire/inquiry.htm>

<https://www.edmodo.com/>

Rationale Paragraph:

Students use the iPads to take a pretest that uses fill in the blank, multiple choice, matching, true/false, and short answer to present their prior knowledge to the teacher and also they will receive immediate feedback from the Edmodo quiz generator so they can focus their learning on the areas of matter they got incorrect as the lesson is being taught. This helps the students track their knowledge, and the teacher also receives immediate feedback to know where to start teaching the structure and transformation of matter. If all the student know the three main states of matter, then the teacher can spend less time explaining the three familiar states and more time discussing the fourth state of matter which is plasma and many student may not be familiar with plasma. Also dividing students up into specific groups and referring them to the websites will allow them to focus just on the one state of matter and will not overwhelm them with information. They will then have to work together and use the iPad to participate in the simulation about the states of matter and also this will help them learn about the properties of their particular group's state of matter. In other words they will be teaching one another about the state and collaborating on how to solve the problems presented in the simulation. This would be the "5 E's of science," which is a research based model on the best way to teach science and allow students to teach themselves. Students remember more of what their teacher "does" than "says." Students can use the websites listed to extend their learning and understanding of the concept of the four states of matter. The websites can also be used for reference, or future use. There are some areas of this lesson plan that are dramatizing such as the activity using the four states of matter, the eight minute video, and having students write down their own information sheet to share with other groups. There is not additional technology used here because research says that children learn in many different ways. Some children learn better with technology, kinestically, or visually. This addresses three types of learning for the students. It is my belief that technology cannot replace the teacher but it can enhance the lesson. Technology is used to enhance the lesson. There is still some teacher guidance with the activities. This also allows for the teacher to be freed up in case there are technology issues that need to be addressed if students cannot find the solution themselves.

APPENDIX

A. Transformation of Matter Unit

Structure and Transformation of Matter

Vocabulary:

properties, classify, predict, size, mass, shape, color, temperature, rulers, thermometers, physical change, chemical change, gas, liquid, solid, states of matter, physical properties, volume, density

Pretest needs to be given before lesson 1

Lesson 1: Introduction to liquid, solid, gas, experiment

Lesson 2: Solids, how to measure solids

Lesson 3: liquid, how to measure liquid

Lesson 4: gas

Lesson 5: gas

Lesson 6: classifying solids, liquid, gas

Lesson 7: physical changes

Lesson 8: physical changes

Lesson 9: chemical changes

Lesson 10: chemical changes

Posttest will be given after Lesson 10

I can classify matter into different categories.

I can describe the differences between solid, liquid, and gas.

I can describe the differences between chemical and physical changes of matter.

I can analyze how changes occur in matter by identifying what causes the changes.

I can measure matter using the correct instruments.

I would like to use an experiment or hands on activity every day.

I am going to use videos and other media in the classroom to help the students understand the lessons.

I am going to move some students around to facilitate learning (T. from the back of the room to the front of the room, C. to front)

I will adjust my lessons for use in resource rooms and give Ms. M. a copy of my lessons so she can use the computer lab to help students with exposure.

I am going to use a book to help with at least one lesson.

I will have transparencies and have handouts available to students to help with understanding.

I will simplify definitions so students can understand them better.

I will incorporate science vocabulary into spelling and writing.

B. All About Solids, Liquids, and Gases

Video website: <https://www.youtube.com/watch?v=dCcTSfa82yU>

C. Matter Search

SEARCH FOR MATTER

What's matter and what's not? Find some matter and then challenge a partner to guess the object by feeling it -- without looking.



MATERIALS: None.

DOING IT:

1. Don't explain what "matter" is. Just give the instructions: "Find some matter, but don't show anyone." People can look around the nearby surroundings to find a small piece of matter -- a pencil, a book, a shoe, a strand of hair, an apple.

2. With eyes closed, each person takes a partner's object by feeling it.

3. After each person has guessed the partner's object, examine all the objects. Anything found that isn't matter? Explain what matter is and that it's everywhere.

4. *Variation:* Run a race. Everyone has a certain amount of time (e.g. 3 minutes) to find an object with certain characteristics (e.g. hard and smooth; too large to hold in hand; small enough to balance on one finger). After the time is up, the guessing game can begin.

A rock, a jelly doughnut, your finger, and an airplane all have something in common. They are all matter -- something which occupies space and has mass. If something isn't matter, then it's energy.

Everything alive, dead, and never living is made up of atoms. Atoms are microscopically minuscule units of matter. Pretend you could take anything you wanted -- the rock, the jelly doughnut, your finger, or an airplane -- and divide it up. Pretend you could divide it up, smaller and smaller, until you couldn't even see the pieces any more. You would eventually get down to the atom. The universe is a collection of atoms and the space between them. The same atoms have been here since the day the universe began and they will be here until the day it ends. When anything new appears in the world, it's only the old atoms arranging themselves in a new way. Matter cannot be created and it cannot be destroyed.

Topics: States of Matter; Atoms; Senses.

Energy makes things happen. It comes in many forms. Some of these are more obvious than others because you use them to sense the world around you. Light, which you use to see, is one energy form. Sound, which you hear, is another. You can also feel energy with your skin, like when you stand in front of a fire and feel the heat. Movement and electricity are two other forms of energy that you use every day.



D. Student Demonstration of States of Matter

WATER IN A JAR

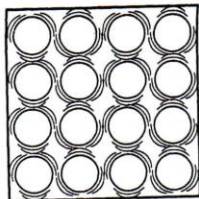
Solid, liquid, and gas -- the three basic states of matter. Make a people model of matter that shows how energy affects these three states.

MATERIALS: Masking tape.

DOING IT:

1. Mark off a large square on the ground with masking tape; leave one side open. The marked area represents an open jar. People will pretend that they're water in the jar. Individuals will be atoms as a solid (ice) changes to a liquid (water) and then a gas (steam). Note: This is a simplified model. Water is actually made up of groups of atoms (i.e. a water molecule is made up of two hydrogen atoms combined with one oxygen atom).

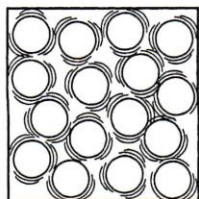
2. Everyone begins by standing close together at the bottom of the "jar" and opposite the opening. "You're atoms in ice. You're frozen solid. But, look -- the sun is coming out! You're beginning to get a little warmer."



SOLID

3. Everyone sways a little from side to side to represent atoms vibrating. "You can feel the heat. You start to sway back and forth. You sway a little more. You're melting. You're becoming a liquid."

4. Everyone continues to sway, but also starts to move around slowly. "You're a liquid now. You rock back and forth as you walk around. You walk *slowly* around in the bottom part of the jar. Stay in the lines. You're water in a jar."

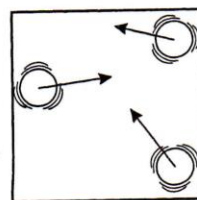


LIQUID

5. A few "atoms" near the "mouth" of the "jar" break away: "It's getting warmer. Someone is heating the jar over a stove. You rock back and forth more. A few of you evaporate from the top of the jar. You move around quickly outside the jar."

6. Everyone sways more (bends far to one side and then far to the other) and continues to walk until they leave the "jar": "Hey, it's really hot. You're boiling. You're rising up out of the jar into the air."

7. People now move quickly outside the "jar": "You're a gas now. You move quickly all over the place. You move in a straight line until you hit something. Then you bounce off and move in a straight line in a new direction."



GAS

8. Repeat the process, going from liquid in a jar to a solid.

Heat energy can cause one state of matter to change into another state. The particular state of a type of matter depends both on the matter itself and the temperature.

A "solid" is something that maintains its shape. The atoms (or molecules) of a solid vibrate in a fixed place. When heat is applied, the atoms begin to vibrate more. At a temperature called the "melting point", the atoms vibrate enough so that they break out of their fixed positions and the solid becomes a liquid. A "liquid" maintains its volume (the amount of space it takes up), but takes the shape of its container. The atoms of a liquid still vibrate, but they also move around slowly. When heat is applied, some atoms near the surface begin to vibrate enough to break away from the liquid (evaporate). At a temperature called the "boiling point", atoms throughout the liquid vibrate more and gas bubbles rise to the surface. The liquid then changes completely to a gas. A "gas" has no fixed volume, but takes up the volume of its container. The atoms of a gas move around quickly and are spaced far apart. When heat is applied to a gas, the atoms move faster.

Topics: States of Matter; Atoms; Energy.



E. Physical Science Vocabulary Power Point Presentation

Physical Science Vocabulary

Everything is made of matter;
matter is made of atoms.



Matter



Atoms are the
building blocks
of matter.

Structure and Transformation of Matter

Matter-Anything that takes up space
Atoms-tiny particles that form matter
(building blocks)



Solid- A solid is anything that takes up space and has mass.

Liquid—A liquid has definite volume but takes on the shape of its container.

Gas—Gas does not have definite shape or volume.



Physical Property—A physical property is anything that can be observed about the matter using your five senses. You can also observe the measurements of matter using a ruler, tape measure, scale, or thermometer.



Volume: the amount of space matter takes up

Mass: amount of matter in an object, this always stays the same even if the object goes through a physical change

F. Structure and Transformation of Matter Pretest/Posttest

Directions: Read the following sentence and fill in the blank with the correct answer.

1. All matter is made of _____.
2. Everything that takes up space is_____.
3. The amount of space that matter takes up is _____.
4. When a liquid changes into a gas, the process is called_____.

Directions: Read the following statement and choose the correct answer. Choose only one answer.

5. There are two jars that are the same size. One is filled with peanut butter and the other is filled with jelly. They have the same volume but not the same_____.

- A. heat
C. mass
- B. evaporation
D. gas

6. Which of the following involves a chemical change?

- A. dissolving soap in water
C. burning paper
- B. cutting paper with scissors
D. filling a balloon with air

7. Which of the following is a physical change?

- A. mixing blueberries, strawberries, and raspberries
B. rusting iron on a car
C. burning a log
D. cooking pancakes

8. When you add heat to ice to turn it into liquid water, you make a---

- A. solution
C. chemical change
- B. mixture
D. physical change

Directions: Read the following definitions. Choose from the list of words in the box and write it beside the matching statement. You will only use five words.

9.

physical property	solid
liquid	gas
mass	matter

- a. Matter that has definite shape._____
- b. Anything you can observe about an object by using your senses._____
- c. The amount of matter in an object._____
- d. This kind of matter has no definite shape but it does have a definite volume._____
- e. This kind of matter has no shape and no volume._____

Directions: Read the statements. Write a T in the blank if you think the statement is true. Write an F in the blank if you think the statement is false.

10. _____a. Matter that contains two or more different things that can be separated is a solution.
- _____b. A change in which no new kinds of matter are formed is a physical change.
- _____c. A mixture in which the particles of different kinds of matter mix together evenly is a mixture.
- _____d. A change that makes new kinds of matter is called a chemical change.

Directions: Read the following information below. Write your response using complete sentences.

11. You have been given a list of ingredients to use in baking a chocolate cake. Since the directions tell you to divide the ingredients into solids, liquids, and gases, you must separate them before you start mixing.

- a. Classify the following ingredients into categories of solid, liquid, or gas using the table below.
- b. When you finish sorting the ingredients, justify the reason for your sorting by writing a sentence about each category using the properties of matter and what makes them a solid, liquid, or gas.

Ingredients

2 c. sugar	1-1/2 tsp baking soda	1/2 c. vegetable oil
1-3/4 c. all-purpose flour	1 tsp. salt	2 tsp. vanilla extract
3/4 c. Hershey®'s cocoa	2 eggs	1 c. boiling water
1-1/2 tsp. baking powder	1 c. milk	

Solid	Liquid	Gas

Directions: Read the following information below. Write your response using complete sentences.

12. When you finish mixing the ingredients for chocolate cake, you place the cake in the oven.
- a. Draw a picture of what the cake will look like when it is finished.
 - b. Determine if a chemical or physical reaction takes place during cooking.
 - c. Using what you know about chemical and physical reactions explain how you know this reaction occurred using 2-3 sentences.

G. Structure and Transformation of Matter Pretest/Posttest Key

Directions: Read the following sentence and fill in the blank with the correct answer.

Learning Goal 1 (LG 1) 1. All matter is made of _____. **atoms**

(LG 1) 2. Everything that takes up space is _____. **matter**

(LG 1) 3. The amount of space that matter takes up is _____. **volume**

(LG 1) 4. When a liquid changes into a gas, the process is called _____.
evaporation/physical change

Directions: Read the following statement and choose the correct answer. Choose only one answer.

(LG 1) 5. There are two jars that are the same size. One is filled with peanut butter and the other is filled with jelly. They have the same volume but not the same_____.

A. heat

B. evaporation

C. mass

D. gas

Learning Goal 2 (LG 2) 6. Which of the following involves a chemical change?

A. dissolving soap in water

B. cutting paper with scissors

C. burning paper

D. filling a balloon with air

(LG 2) 7. Which of the following is a physical change?

A. mixing blueberries, strawberries, and raspberries

B. rusting iron on a car

C. burning a log

D. cooking pancakes

(LG 2) 8. When you add heat to ice to turn it into liquid water, you make a---

A. solution B. mixture C. chemical change **D. physical change**

8pts

Directions: Read the following definitions. Choose from the list of words in the box and write it beside the matching statement. You will only use five words.

9.

physical property	solid
liquid	gas
mass	matter

(LG 1) a. Matter that has definite shape._____ **solid**

(LG 1) b. Anything you can observe about an object by using your senses._____ **physical property**

(LG 1) c. The amount of matter in an object._____ **mass**

(LG 1) d. This kind of matter has no definite shape but it does have a definite volume._____ **liquid**

(LG 1) e. This kind of matter has no shape and no volume._____ **gas**

Directions: Read the statements. Write a T in the blank if you think the statement is true. Write an F in the blank if you think the statement is false.

(LG 2) 10. ___**F**__a. Matter that contains two or more different things that can be separated is a solution.

(LG 2) ___**T**__b. A change in which no new kinds of matter are formed is a physical change.

(LG 2) ___**F**__c. A mixture in which the particles of different kinds of matter mix together evenly is a mixture.

(LG 2) ___**T**__d. A change that makes new kinds of matter is called a chemical change.

9pts

Directions: Read the following information below. Write your response using complete sentences.

(LG 1) 11. You have been given a list of ingredients to use in baking a chocolate cake. Since the directions tell you to divide the ingredients into solids, liquids, and gases, you must separate them before you start mixing.

a. Classify the following ingredients into categories of solid, liquid, or gas using the table below.

b. When you finish sorting the ingredients, justify the reason for your sorting by writing a sentence about each category using the properties of matter and what makes them a solid, liquid, or gas.

Ingredients

2 c. sugar	1-1/2 tsp baking soda	1/2 c. vegetable oil
1-3/4 c. all-purpose flour	1 tsp. salt	2 tsp. vanilla extract
3/4 c. Hershey®'s cocoa	2 eggs	1 c. boiling water
1-1/2 tsp. baking powder	1 c. milk	

Solid	Liquid	Gas
sugar	milk	boiling water
flour	eggs	
cocoa	vegetable oil	
baking powder	vanilla extract	
baking soda	boiling water	
salt		
eggs		

Solids have a definite shape and volume. All my ingredients retain their shape when put in other containers.

Liquids have volume but no definite shape. All my ingredients take the shape of their container.

Gas has no definite shape or volume. Boiling water turns into steam which is a gas. Eggs can be either a solid (the hard shell) or a liquid (the yolk).

Part A: 2pts
Part B: 2pts
Total: 4pts

Directions: Read the following information below. Write your response using complete sentences.

(LG 2) 12. When you finish mixing the ingredients for chocolate cake, you place the cake in the oven.

- Draw a picture of what the cake will look like when it is finished.
- Determine if a chemical or physical reaction takes place during cooking.
- Using what you know about chemical and physical reactions explain how you know this reaction occurred using 2-3 sentences.

a.



b. A chemical reaction takes place.

c. I know a chemical reaction occurred because when you place the cake in the oven, it is hot and causes the ingredients to go from a liquid to a solid. Once it is a solid, you cannot make it a liquid again or get back the original matter. A new type of matter is formed because the atoms were changed during the baking process. A chemical reaction is when new matter is formed. The oven changes the original matter into new matter. You cannot put the cake back the way it was before it was a cake. The heat changes the mixed ingredients into something new.

Part A: 1pt
Part B: 1pt
Part C: 2pts
Total: 4pts

Test Total: 25pts

LG 1: 14pts

LG 2: 11pts

Rubric for Open Response-Question 11a.-b.

4

all parts answered

all ingredients correctly categorized

one complete sentence using science vocabulary for each category

a total of 3 complete sentences

must include solid, liquid, gas or mass, volume, space

3

not all parts answered

all ingredients correctly categorized

partial complete sentence for each category

at least 2 complete sentences

includes some science vocabulary

2

at least one part answered
ingredients are not correctly categorized
incomplete or no sentences
little or no science vocabulary

1

one part partially answered
little attempt made to correctly categorize labels
no sentences
little or no science vocabulary