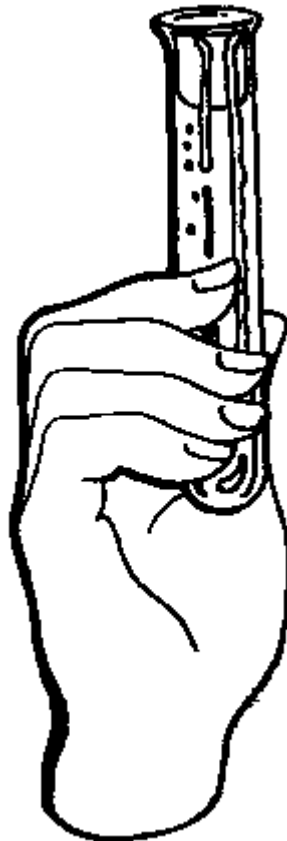


# What's the Matter?



-a lesson for students in grade 4

AnnMarie McCafferty  
PA Governor's School  
For Physical Science  
July,2001

## Academic Standards

- 3.1.4.E. Recognize changes in natural and physical systems.
- Describe the changes to objects caused by heat, cold, light, or chemicals.
- 3.2.4.A. Identify and use the nature of scientific and technological knowledge.
- Provide clear explanations that account for observations and results.
- 3.2.4.B. Describe objects in the world using the five senses.
- Recognize observational descriptors from each of the five senses.
  - Use observations to develop a descriptive vocabulary.
- 3.4.4.A. Recognize basic concepts about the structure and properties of matter.
- Describe properties of matter.
  - Know that combining two or more substances can make new materials with different properties.
  - Know different material characteristics.
- 3.7.4.B. Select appropriate instruments to study materials.
- Develop simple skills to measure, record, cut, and fasten.



## Objectives

- Students will be able to accurately describe various states of matter.
- Students will change variable and see the outcome of the experiment.
- Students will be able to make clear observations about the matter and changes that occur once a variable is manipulated.
- Students will be able to make clear observations about the matter and changes that occur once a variable is manipulated.





## **Background Knowledge**

- ❖ Matter is a solid, liquid, or gas.
- ❖ Solids are matter with a definite shape and mass.
- ❖ Liquids have a measurable volume and take the shape of its container.
- ❖ “Goofy Putty” is a polymer. Changing the quantity of the components used in the formula will more closely align the new product with either the characteristics of a solid or a liquid.
- ❖ Relevance of Lesson – Types of Matter is a unit we enjoy in fourth grade. This lesson will be presented after we have done a significant amount of experimenting to determine the qualities of solids and liquids. The children have been working in lab groups for some time, and are comfortable with the idea of testing and variables. This lab would be, in its own way, a type of Venn diagram comparing and contrasting the two.

## Set Induction

- ❖ Prior to lesson, teacher will make a sample of “Goofy Putty” (triple formula to have sample large enough to be viewed by class.).
- ❖ Teacher will initiate a discussion reviewing the characteristics of a solid and a liquid as determined by previous inquiry, experimentation, and discovery.
- ❖ Teacher will display **Mystery Matter**. Both teacher and selected students will manipulate matter in an attempt to stimulate hypothesis about material.
- ❖ On large display chart, develop KWL for Mystery Matter, adding to each column as lesson allows.





## **Procedures**

Materials needed: plastic cups (5)  
white glue(1)  
water (1small cupful)  
borax (1 small cupful)  
popsicle sticks (5)  
measuring spoon (1)  
worksheets 1 and 2  
pencil  
paper towel (for spills)

\*\*\*\*\*

### **Safety Notice:**

- Students are to be reminded that the policy of the science lab dictates that NOTHING is to be eaten during labs, especially the materials used in the lab.
- Spills are to be wiped up immediately, and disposed of properly.
- Six-inch voices are to be used in lab groups to permit important information to be heard.

\*\*\*\*\*

### Procedure:

1. Put one teaspoon of white glue in a cup.
2. Add 1 teaspoon of water and mix well with popsicle stick.

3. Measure one teaspoon of the borax solution, and stir well.
4. Remove the Goofy Putty and roll into a ball.
5. With your lab group determine the characteristics of this material using your senses. Record findings on worksheet 1.
6. Replace putty in cup, and label cup CONTROL.
7. Take remaining 4 cups and label 1,2, 3, and 4.
8. Within group decide which of the components will be varied in cups 2 through 4. Note the variable on worksheet 2.
9. Repeat steps 1 through 4, allowing for the variable. Discuss difference between each cup's material and the control. Note on worksheet 2.





## Resources

“Goofy Putty”- Macromolecular Products – Experiments with Polymers – Annette M. Jacobson and Rosemary Frollin, Carnegie Mellon University, July, 2001

Academic Standards for Science and Technology, Pennsylvania  
Department of Education, July 12, 2001

Discovery Works Silver Burdett Ginn Science – Teacher Resource Book, Grade 4, 1996

<http://www.nationalgeographic.com/resources/ngo/education/plastics/index.html>

<http://www.chem4kids.com/matter/index.html>

Name - \_\_\_\_\_ Date - \_\_\_\_\_

What's the Matter? - worksheet 1

Write the number of words indicated to describe the qualities of the "Goofy Putty" which you observed.

Touch (5)	Smell (2)	Sight (5)	*Taste	Sound (2)

From your observations and your background knowledge, Hypothesize as to whether the "Goofy Putty" is a solid or a liquid. Support your ideas with at least two facts.



## Rubric for worksheet 1

Name - \_\_\_\_\_ Date - \_\_\_\_\_

### What's the Matter? - worksheet 1

Write the number of words indicated to describe the qualities of the “Goofy Putty” which you observed.

Touch (5)	Smell (2)	Sight (5)	*Taste	Sound (2)

#### Points per column

3

2

1

#### What to look for

Requested number of descriptive words are included. All are accurate.

Requested number of descriptive words are included. Most are accurate.

Student's responses show that he/she is unfamiliar with concepts.

From your observations and your background knowledge, hypothesize as to whether the “Goofy Putty” is a solid or a liquid. Support your ideas with at least two facts.

#### Points

3

2

#### What to look for

Hypothesis is clear and is based on data recorded, and based on an understanding of the characteristics of matter.

Hypothesis is clearly expressed and is somewhat based on the data gathered. Some understanding

1

of the characteristics of matter shown.  
Hypothesis is not clearly expressed and/or not based on data. Very little understanding of the characteristics of matter.



Name - \_\_\_\_\_ Date - \_\_\_\_\_

What's the Matter? – worksheet 2

Complete the chart. **Remember**, change only 1 variable.

	Control	Cup #1	Cup #2	Cup #3	Cup #4
Glue	1 teaspoon				
Water	1 teaspoon				
Borax Solution	1 teaspoon				

Compare each new matter to the Control “Goofy Glue”. Is it more solid, more liquid, or the same? What would have caused the change in characteristics? ( Respond in sentences, please)

Cup #1 \_\_\_\_\_

\_\_\_\_\_

Cup #2 \_\_\_\_\_

\_\_\_\_\_

Cup #3 \_\_\_\_\_

\_\_\_\_\_

Cup #4 \_\_\_\_\_

\_\_\_\_\_

## Rubric for worksheet #2

Name - \_\_\_\_\_ Date - \_\_\_\_\_

### What's the Matter? – worksheet 2

Complete the chart. **Remember**, change only one variable.

	Control	Cup #1	Cup #2	Cup #3	Cup #4
Glue	1 teaspoon				
Water	1 teaspoon				
Borax Solution	1 teaspoon				

#### Points

#### What to look for

- 3 Each cup has only one variable change noted. The change is realistic.
- 2 Most cups have only one variable changed. The changes are realistic.
- 1 Most recorded measurements are inaccurate.

Compare each new matter to the Control “Goofy Glue”. Is it more solid, more liquid, or the same? What would have caused the change in characteristics? ( Respond in sentences, please)

#### Points

#### What to look for

- 3 All responses compare the two materials. Predictions, based on observations, are given for characteristic change.
- 2 Most responses compare the two materials. Predictions show some relationship to observations.
- 1 Responses show little understanding and/or no comparison of materials.

Cup #1 \_\_\_\_\_

Cup #2 \_\_\_\_\_

Cup #3 \_\_\_\_\_

Cup #4 \_\_\_\_\_

