LESSON 12

Testing Rainy Day Fabrics

Overview and Objectives

The three lessons that focus on ram conclude with this one, in which students experiment with ways that different types of fabric respond to water. In discussing the results of their investigation, students use their observations to draw conclusions about which fabric would keep them driest on a rainy day. From a reading selection that describes the invention of waterproof cloth, students discover that rainy day fabrics have been the subject of experimentation for a long time.

- Students conduct an experiment with fabrics and water.
- Students record their results and draw conclusions.
- Students read about and discuss the history of the mackintosh raincoat.

Background

The fabrics selected for the activity in this lesson were chosen because they are typically worn by children-cotton, a cotton-polyester blend, wool, and nylon. In the experiment, each fabric is secured on top of a plastic cup. After pouring water over each fabric, students will observe two things: how much water has passed through the fabric into the cup and how wet the fabric feels. On the basis of these observations, the students can draw conclusions about which fabric would keep them driest on rainy days.

When a fabric becomes completely saturated, it can no longer absorb more water: any more water poured over it passes through it. Cotton and cotton-polyester absorb water quickly and become saturated almost immediately. This means that most of the water poured over them will pass through them, and because they are thoroughly saturated, they will feel very wet.

Wool absorbs water more slowly and takes longer to become saturated. Given its slow absorption rate and the small amount of water used in this experiment, little if any water will pass through the wool, although the wool will feel slightly damp. Nylon does not absorb any water. No water passes through the nylon: it feels very dry.

Note: The results of this experiment may vary depending on the thickness of each fabric, on the looseness or tightness of the weave, and on any chemical treatment that a piece of fabric might have received in manufacturing.

Materials

For each student

1 copy of **Record Sheet 12-A: Rainy Day Fabrics**
Crayons to match the colors of the four fabrics

For every four students

1 aluminum pie plate, 20 cm (8 in) diameter
1 small plastic cup, 118 ml (4 oz)
4 medium plastic cups, 296 ml (10 oz)
4 rubber bands
4 pieces of fabric (cotton, cotton-polyester, wool, and nylon) in different colors, 15 cm (6 in) square

For the class

2 plastic pails of water
Paper towels or sponges

Preparation

1. Make a copy of **Record Sheet 12-A: Rainy Day Fabrics,** on pg. 128, for each student.
2. Try the experiment before presenting it to the class so that you are familiar with the fabrics. It will be important to pour the water over the fabrics very slowly.
3. Divide the class into groups of four students each.
4. For easier distribution of the materials, put the materials for each group in a pie plate.
5. Place the pails of water where they will be accessible to more than one student at a time.

Figure 12-1

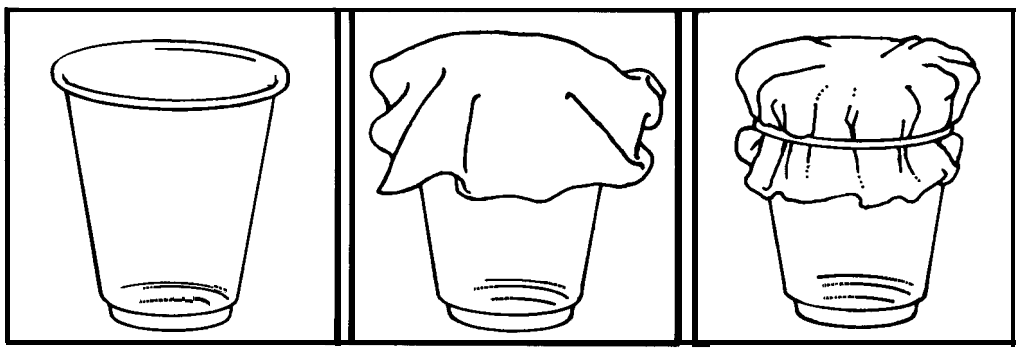
Caught in the rain

Procedure

1. Ask students the following questions: If everyone in the class went out in the ram today without an umbrella, whose shirt or jacket would keep them driest? Would everyone get just as wet as everyone else?
2. Encourage as many responses as possible. As the children respond, ask them to explain their answers: perhaps they have been caught in the ram.
3. Let students know that they will be doing an experiment to help them answer the questions and that the experiment will involve testing fabrics. Hold up each of the four squares of fabric and identify them as cotton, cotton-polyester, wool, and nylon. As you describe each type, point out any of the students' clothing made of that fabric.
4. Show students how to use a rubber band to secure a piece of fabric on a medium plastic cup, as illustrated in Figure 12-2. Explain that the experiment will involve working in groups of four, pouring water slowly over each piece of fabric attached to a cup, and observing certain results.

Figure 12-2

How to cover a cup with fabric



5. Point out that as they test each fabric, students should observe how much water goes through the fabric into the cup and how much spills over into the pie plate. They should also feel each fabric to see how wet it has become after the water is poured over it.
6. Distribute the materials for the experiment to each group. Have each member of the group select a piece of fabric and secure it on a cup with a rubber band.
7. Have the groups test one fabric at a time. One student from each group will first need to collect one small plastic cup of water from one of the pails. That student will slowly pour that one cup of water over the fabric as the others in the group observe and then feel the fabric to find out how wet it is. Students will need to empty the water from the pie plate into one of the pails or a sink before experimenting with the next fabric.
8. When the groups have completed the experiment, have them place their four cups in a row, so that the cup with the most water inside it is first and the cup with the least water is last.
9. Let each group share with the class what the order of their cups turned out to be. Also ask them to describe how wet or dry each of the four fabrics is.
10. Distribute crayons and a copy of **Record Sheet 12-A: Rainy Day Fabrics** to each student. On their record sheets, have students color the fabrics on the cups to match the real colors of their experiment fabrics. Then have them

color in the amount of water in each cup and write their responses to the questions on the record sheet.

11 Have students clean up by emptying the water in the cups into one of the pails or a sink.

Final Activities

1. Have students use the results of their experiment to discuss which fabric would keep them driest on a rainy day.
2. Read **"A Coat to Keep You Dry,"** on pg. 126, to the class and then discuss these questions:
   - What kinds of coats besides raincoats protect us from the weather? (For example, parkas and windbreakers.)
   - Many animals do not have feathers to protect them like birds do. What protects these animals from the weather? (For example, a bear's fur, snail's shell, elephants thick skin.)

Extensions

SCIENCE

1. Have students set up an experiment to find out how long it takes each of the four fabrics used in this lesson to dry out completely. Ask them to discuss which fabric they would rather be wearing if they got caught in the ram.

SCIENCE

2. Have students bring in other fabrics to test and then create a class chart to record which ones repel water best.

MATHEMATICS

3. Brainstorm to come up with a list of ram gear. Make a graph entitled "Rainy Day Ram Gear," like the one shown in Figure 12-3. Have students put "x's" on the graph to show what kind of ram gear they use.

Figure 12-3

A rain gear graph

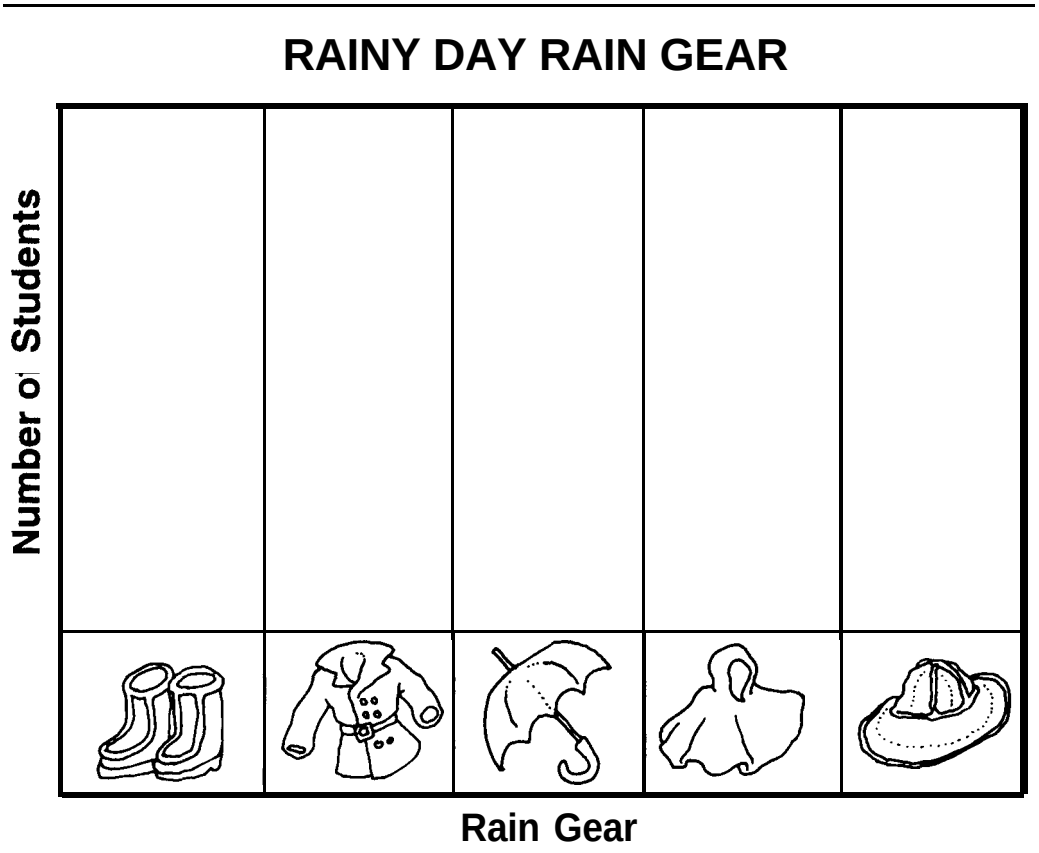
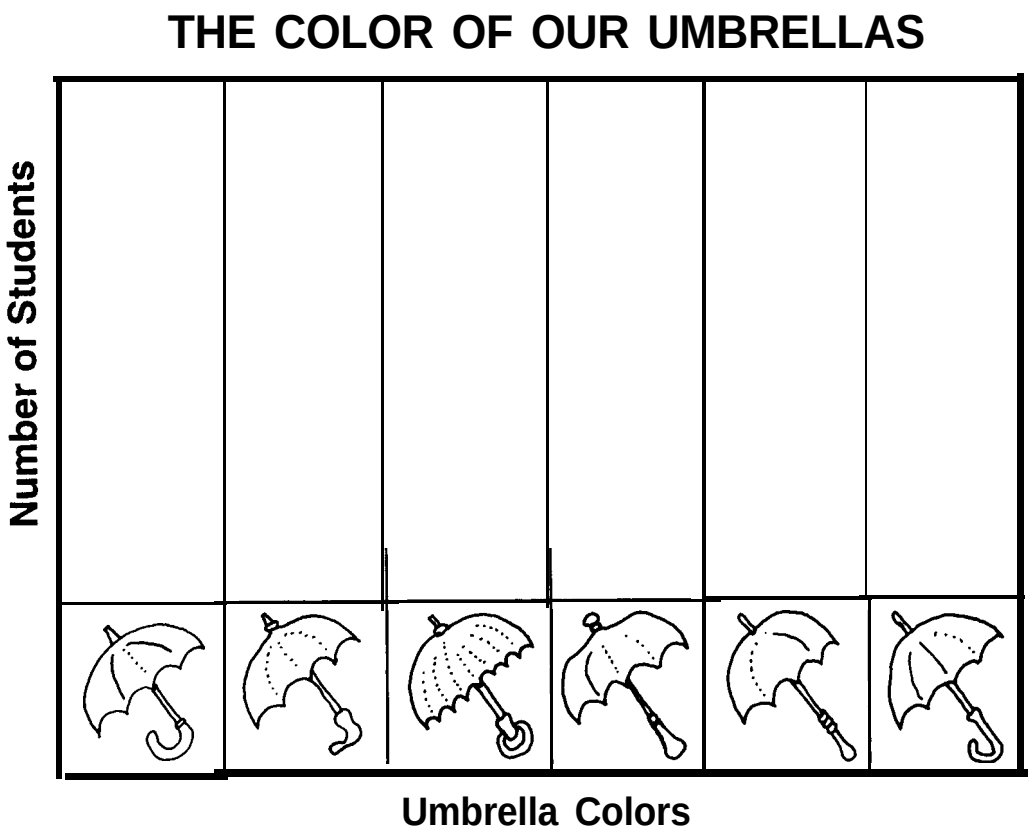


Figure 12-4

An umbrella graph



MATHEMATICS

4. Make a graph entitled "The Color of Our Umbrellas," like the one illustrated in Figure 12-4. Let each student draw a picture of an umbrella, color it to match his or her own umbrella, and put it on the graph.

(SOCIAL STUDIES)

5. To introduce students to another culture, read a book such as *Bringing the Rain to Kapiti Plain,* by Verna Aardema. Use a map to show the class where Africa is located. Talk about how the weather in different regions of Africa compares with your local weather.

Assessment

Observational Guidelines

Continue to listen for the spontaneous comments students might make about the weather and how it affects them. For example, notice whether they discuss the weather more frequently or whether they make specific comments about the clothes they are wearing in relation to the weather.

Reading Selection

A Coat to Keep You Dry

Have you ever watched a bird sitting on a tree branch
in the warm summer rain?
Did you hear the bird singing cheerfully
as it fluffed up its feathers?

Would you be cheerful if you were out in the rain?
Would you be singing happily and skipping along?
Or would you be racing to get inside?

If you were wearing your raincoat,
you might be just as cheerful as a bird.
A bird's feathers keep it from getting "soaked to the skin.'
Your raincoat keeps you from
getting soaked if you are
out in the rain.

Raincoats are made in a special
way to keep people dry.
They are made with
waterproof cloth.
Rain cannot go through
waterproof cloth.

The man who invented the first
kind of waterproof cloth
was named Charles Macintosh.
He lived in Scotland about two
hundred years ago.

This is how Mr. Macintosh made the cloth.
He knew that water would not go through rubber.
So, first he found a way to turn rubber into a liquid.
Then he painted the liquid rubber on a piece of cloth.
Another piece of cloth went on top.
When the rubber dried, the cloth and the rubber were stuck together, like a peanut butter sandwich.
Water could not get through this cloth.
It was waterproof.

Mr. Macintosh soon began making raincoats with the new cloth.
People were very happy because his coats kept them dry.

The waterproof raincoat that Charles Macintosh invented was named after him. It is called a "mackintosh."

Record Sheet 12-A

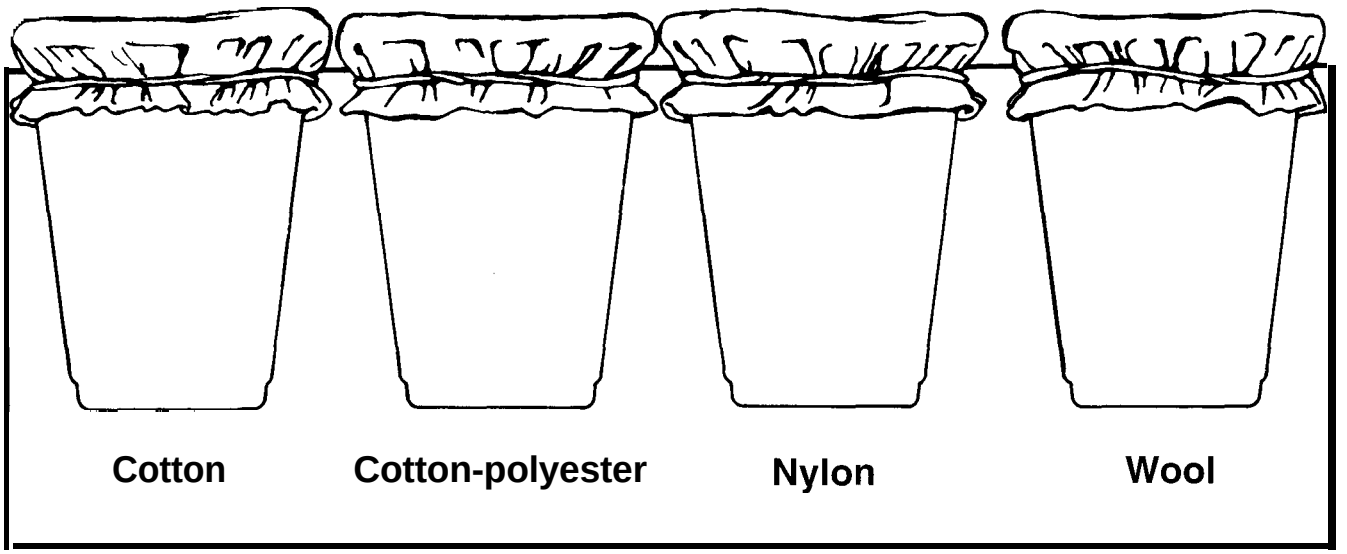
Name: _____

Date: _____

Rainy Day Fabrics

Color the fabric on each cup,

Color the cups to show how much water is in them.



Which fabric would you wear in the rain?

_____

_____

Why? _____

_____

_____

_____