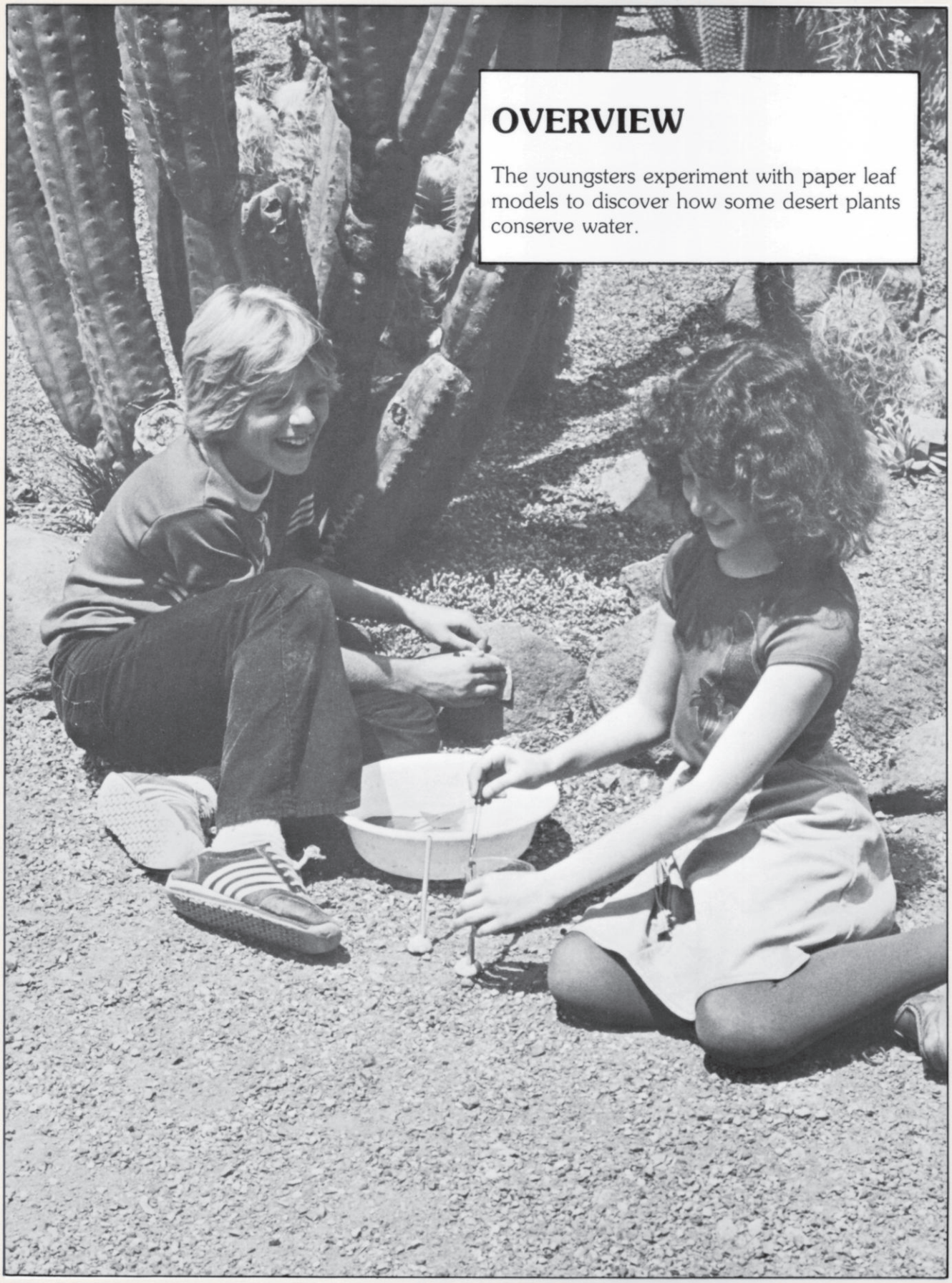
DESERT WATER KEEPERS

BIO KEY

Simulation
Plant Investigation
Adaptation



OVERVIEW

The youngsters experiment with paper leaf models to discover how some desert plants conserve water.

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BACKGROUND

Adaptations help plants conserve water in the dry, often hot desert. ***Adaptations*** are features of organisms that help them to survive and reproduce. Listed below are four adaptations of desert plants that allow them to store and conserve water.

1. A leathery or waxy coating on leaves and stems reduces evaporation.

2. Thick stems or other part of plants provide water-storage space.

3. Small leaves or spines (modified leaves) reduce the surface area of the plant exposed to the sun. (Some plants, such as the ocotillo and palo verde, shed their leaves during dry spells, further reducing their surface area.)

4. Spines and fine hairs reflect heat and reduce the air flow over the plant's surface.

Many plants have a combination of these adaptations. For example, the hedgehog cactus has enlarged stems; a thick, waxy coating; and a dense cover of spines.

CHALLENGE: FIND OUT HOW SOME DESERT PLANTS CONSERVE WATER.

MATERIALS

For each team of two or three:

2 plastic coffee stirrers* (double-straw type)
2 blotter-paper leaves*† of the same shape
2 plastic bags* (about 20 cm x 20 cm)
2 leaf holders†
2 40-cm pieces of string*
2 pieces of flagging*

†See the "Desert Leaf Models" Technique Card.

For the group:

1 cup of water (about 200 ml) colored with red, green, or blue food coloring*
1 small bucket or basin of water
several medicine droppers*
several crayons*
masking tape* or transparent tape*
stapler
extra plastic bags* and string*
1 data board*
1 marking pen*
1 metric ruler*
1 large comb* (required only if cholla are present)
1 "Desert Leaf Models" Technique Card*
1 "Desert Leaf Patterns" card*

Optional for "Branching Out":

clear plastic cups*
clear plastic wrap*
rubber bands*

*Available from Delta Education.

PREPARATION

Group Size. This activity works well with any size group.

Time. Plan on fifty to sixty minutes for this activity. Choose a hot, sunny day.

Site. This activity has been developed for the desert, but will work in any area that is hot and dry. Select a level area in full sunlight about two meters across for the teams to set out their leaf models.

Materials

1. There are three leaf shapes on the "Desert Leaf Patterns" card. Each team will need two leaves of one shape. Make sure that all three shapes are used. To make the leaf models, follow the directions on the "Desert Leaf Models" Technique Card.

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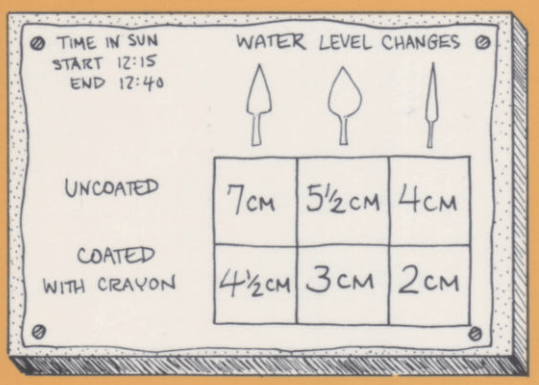
2. Make a drinking-straw leaf holder so you will know how it is done. (See the Technique Card.)

3. Draw the illustrated chart (without the data) on the data board.



Safety. *Keep off the cactus!* Be careful while working around cactus, particularly the chollas. If a youngster does happen to get a spiny piece of cholla stuck to him, don't grab the cholla to pull it off. Rather, work a comb in between the skin or clothing and the cactus, and then flip the piece away. Don't flip it on someone else! Warn the kids about the dangers of cacti before starting the activity.

ACTION

TESTING PAPER MODELS

Introducing the Experiment

1. Tell the youngsters that they are going to find out how desert plants conserve water.

2. Display the three leaf shapes. Ask the youngsters to describe the differences in the shapes and give each shape a name.

3. Form teams of two or three, and give each team a matched pair of paper leaves. Make sure all three shapes are in use.

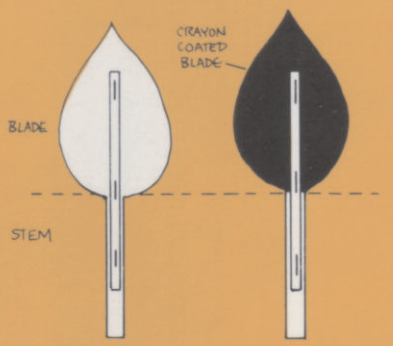
4. Explain to the youngsters that they are going to find out:

- which leaf conserves the most water, and
- what effect a coating has on a leaf's ability to conserve water.

Setting up the Experiment

1. Preparing the Leaf Models. Each team:

- colors both sides and the edge of *one* leaf blade.
- staples a coffee stirrer along the center line of both leaves (for support).
- soaks both leaves in the basin of water while making the leaf holders.



2. Making Leaf Holders. Each team:

- makes two drinking-straw leaf holders and fills them nearly to the top with dyed water. (See the Technique Card.)
- sets up their two leaf holders about a hand span apart in the area you selected for the experiment.

3. Starting the Experiment. Each team:

- retrieves their leaves from the basin.
- stands next to their leaf holders.
- puts their leaves into their holders *at your signal!*
- checks to make sure their holders are *full* of dyed water.

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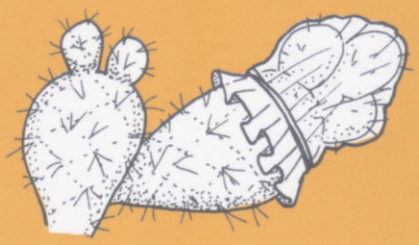
4. Record the time (when the leaves went in) on the data board, and leave the leaf models in the sun for *at least twenty minutes.*

TESTING REAL PLANTS

1. Challenge each team to find and flag two plants with leaves resembling the paper leaves. Hand out the flagging and let the hunt begin.

2. Call the teams together after about ten minutes, and visit some of the flagged plants as a group. Ask the youngsters to compare the leaves' shapes and sizes with the model leaves.

3. Show the youngsters how to tie a plastic bag around some of the leaves or stems on a plant. (See the illustration.)



4. Distribute the bags and strings to the teams, and let the youngsters "bag" some of the plants. Tell them not to worry if a few spines puncture the bag.

WATER RATIONALE

1. After the teams have "bagged" their plants, call the youngsters back to the leaf-model site.

2. Have the teams mark the new water level in each holder with a marking pen and measure the change in the level with the metric ruler. Record the measurements on the data board chart. Ask the youngsters:

- What do you think happened to the water in the holders?
- Which leaf lost the most water? The least water?
- How does the amount of water lost by the crayon-coated leaves compare with the amount of water lost by the uncoated leaves? How can you explain the difference?

3. Ask the teams to return to the plants they "bagged" to see if any moisture has collected in the bags.

- Where do you think the moisture in the bags came from?
- Describe the leaves that gave off the most moisture and the least moisture in the bags.

4. Explain that waterproof coatings and thin or tiny leaves are examples of plant adaptations to conserve water. Add that ***adaptations*** are features of organisms that help them to survive and reproduce.

Cleanup. Collect all the bags, strings, and flagging before leaving the area.

BRANCHING OUT

1. Compare the effects different locations have on water loss from leaves. Prepare paper leaf models as before and set some in the sun, others in the shade; some exposed to the wind, others protected from the wind.

2. Many desert animals do not drink water but obtain it from the plants and animals on which they feed. Collect various materials that desert animals might eat (seeds, roots, or flowers). Raw meat could be put out to represent animals eaten by other animals. Place each kind of material into a clear plastic cup, cover the cup with plastic wrap, and then place a pebble in the center of the wrap. Place the cups in the sun. Which materials contain the most water? How can you tell? Can you think of a way to collect the water?

Desert Water Keepers

DESERT LEAF MODELS

Technique Card

MODEL LEAVES

MATERIALS FOR TWO SETS OF LEAVES (SIX LEAVES):

2 sheets of blotter paper*†
1 pair of scissors*
1 "Desert Leaf Patterns" card*

*Available from Delta Education.
†The blotter paper supplied by Delta Education has the outlines of the leaves printed on it.

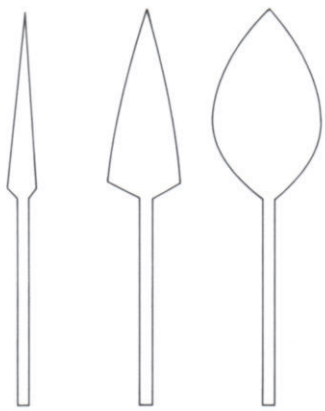
MAKING THE MODEL LEAVES

Instructions for the Leader:

1. Carefully cut out the leaf patterns on the "Desert Leaf Patterns" card to make a stencil.

2. Trace two of each leaf pattern onto the blotter paper (a total of six).

3. Cut out the paper leaves.



LEAF HOLDERS

MATERIALS FOR EACH TEAM:

2 plastic drinking straws* (Coffee stirrers must fit inside straws.)
1 ball of clay*
tape*

*Available from Delta Education.

MAKING AND FILLING THE LEAF HOLDERS

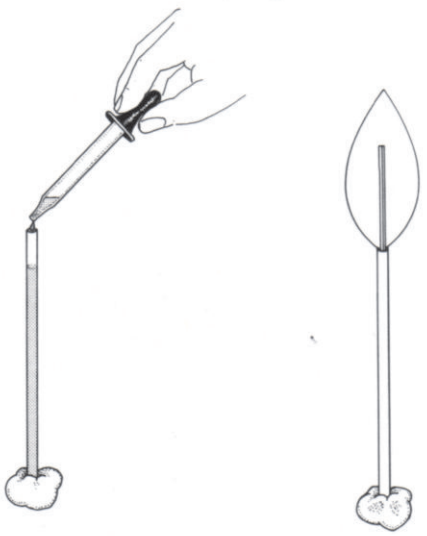
Instructions for the Youngsters:

1. Crimp the drinking straw four centimeters from one end.

2. Squeeze the "V" parts together and tape tightly.

3. Place the taped end of the straw into the clay ball so that the straw stands upright.

4. With a medicine dropper, fill the holders to within a centimeter from the top.



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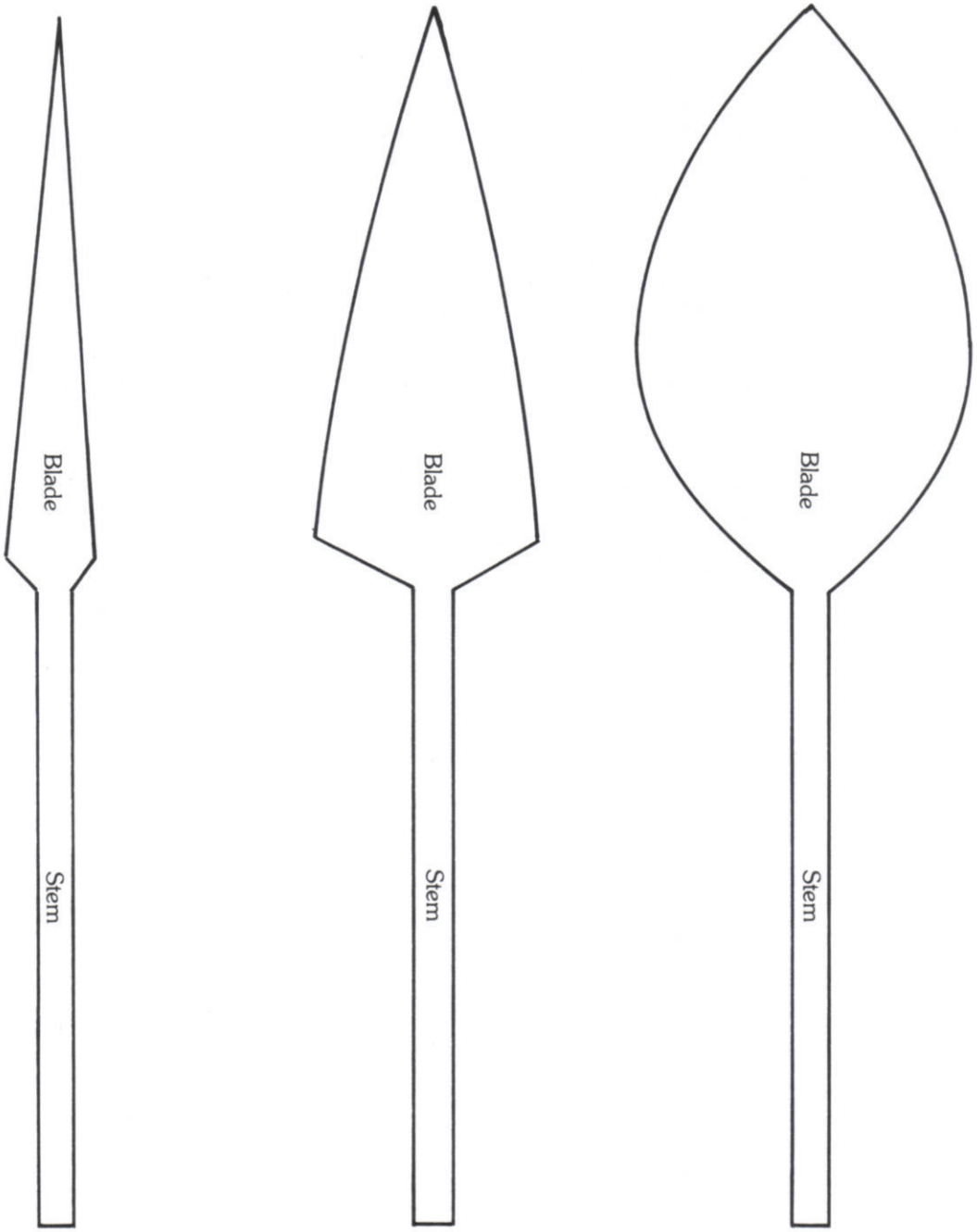
DESERT LEAF PATTERNS



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