

GROW YOUR PALS PROGRAM GUIDE



THE NATIONAL FFA MENTORING PROGRAM

Sponsored by



LESSON 24

Observe the Effects of Light Absorption and Reflection

Unit:
**AGRICULTURAL MECHANICS
AND TECHNOLOGY**

PRECEPTS

- F. Continuous Improvement
- F5. Acquire New Knowledge

NATIONAL STANDARDS

- NS.K-4.1. Science as Inquiry



Lesson Type:
One-on-One

STUDENT LEARNING OBJECTIVES

As a result of this lesson, the student will ...

1. Observe the effects of light absorption and reflection.





TIME

Instruction time for this lesson: **60 minutes.**



RESOURCES

None



TOOLS, EQUIPMENT AND SUPPLIES

- ✓ 7 white plastic or paper cups
- ✓ black spray paint
- ✓ tablespoon measure
- ✓ water
- ✓ plastic wrap
- ✓ rubber bands
- ✓ 4 small thermometers (non-mercury)
- ✓ PALS.24.Assess.A – 1 per student

KEY TERMS



The following terms are presented in this lesson and appear in ***bold italics***:
None

INTEREST APPROACH



Think about the hottest summer day you can remember. You have been inside an air-conditioned building, maybe a store or a movie theatre. You walk outside and the heat hits you. As you walk toward the car, you know that the worst is coming. What is it like when you get in the car?

Move the discussion to the fact that the car is much hotter than it is outside. To break the ice, you may tell a story about an experience you had similar to this, maybe you were wearing shorts and burned your legs on the hot seat, or the door handle was too hot to touch.



So keep these ideas in the back of your head as we dive into today's experiment ... you will probably find this information handy. Let's get our supplies ready and see how these stories apply to plants!

SUMMARY OF CONTENT AND TEACHING STRATEGIES

OBJECTIVE 1. | Observe the effects of light absorption and reflection.



Prior to the lesson, prepare three plastic cups by spray-painting the inside of them black. The paint should be completely dry for the experiment.



Here we have three cups with the insides painted black. Help me out as we use them with our other supplies.

Read the following instructions and have your little PAL set up the supplies accordingly.

1. Put one of the black cups inside a plain white cup and cover it with plastic wrap. Use a rubber band to hold the plastic on.
2. Put one black cup inside a white cup and leave it uncovered.
3. Put one white cup inside another white cup, and cover it with plastic wrap. Use a rubber band to hold the plastic on.
4. Leave one black cup uncovered.
5. Now place 2 tablespoons of water in each cup.



Nice job getting the equipment ready!

Let the PALS know that you are adding a thermometer to each cup. Ask what he or she thinks will happen with each cup. This is also a good moment to explain the dangers of thermometers – ex. glass, mercury, etc.



So what do you think will happen in each cup? What will the black cup do? And how about the plain white one? How about the ones covered in plastic wrap?

Place a thermometer in each cup, put the all the cups on the same a bright sunny window ledge and wait about 30 minutes. After 30 minutes, have your PALS record the temperature in each cup. Have a discussion on what happened. If you are conducting this experiment on a cold or cloudy day, consider placing the cups under a light, but be careful not to allow the plastic cup to touch the light bulb.



It has been 30 minutes, so let's take a look at our cups and see what happened. Let's record the temperature of each cup. So, which was the hottest? Which was the coolest? What do you think accounts for the different temperatures? What does the plastic cover do (hint, think about the car)?

Have the following discussion with your PALS after he or she shares his or her thoughts about the posed questions.



Here are some other facts that might help us understand what happened here today. We know that black absorbs light, and white reflects it. That's why a black shirt can be hotter in the sun than a white shirt. The single cup is not as thick as the double cups, and so it is not as insulated; meaning it does not hold onto its heat or cold as well as the doubled-up cups. The plastic cover helps hold in water and heat. This is why cars are so hot on a sunny day; they are covered (with windows) and pretty well insulated, so the heat cannot escape. What can I clarify so far? Does this make sense?

Allow for general questions if necessary.



How might we apply this knowledge to growing plants?

Lead discussion to what would hold more heat: a plowed field or a green lawn. Answer -- the plowed field.



So as we can see, even the color of soil versus the lighter color of a crop can affect light absorption and temperature.



REVIEW

Use the Hieroglyphics e-Moment to have your PALS draw a symbol of each cup as accurately as possible, including the color; if the cup was covered and if it was double cupped. Next to each cup, write the ending temperature. This will serve as a reminder of the factors that caused the different temperatures.



APPLICATION

Large Group Suggestion: *Do the same experiment but without water. Measure the air temperature. Samples would need to be placed outside for more accurate results. Compare the ending temperature in the cups with the outside ambient temperature.*



Continued One-on-One Discussion/Activity: *How could we design agricultural facilities to capture more of the sun's heat? In hot areas, how could we keep temperatures cooler in these facilities?*



EVALUATION - ANSWER KEY

Use PALS.24.Assess.A

True or False

- ☐ 1. Dark colors absorb sunlight, and light colors reflect it.
- ☐ 2. Heavily insulated items hold their temperature longer than poorly insulated items.
- ☐ 3. The sun's energy cannot pass through clear windows or plastic.

ANSWERS TO EVALUATION

- 1. T
- 2. T
- 3. F

PALS.24.ASSESS.A

Answer true or false for each of the following statements.

True or False

- ____ 1. Dark colors absorb sunlight, and light colors reflect it.
- ____ 2. Heavily insulated items hold their temperature longer than poorly insulated items.
- ____ 3. The sun's energy cannot pass through clear windows or plastic.