

LIGHT

SECTION 3-SUN, SHADOWS AND SUNDIALS

From *Hands on Science* by Linda Poore, 2003.



Westminster College

STANDARDS:

Students know sunlight can be blocked to create shadows.

Students will predict the outcome of a simple investigation, and compare the result with prediction.

MATERIALS:

For Each Student:

Clay
crayon or 1/2 straw
paper plate

For the Teacher:

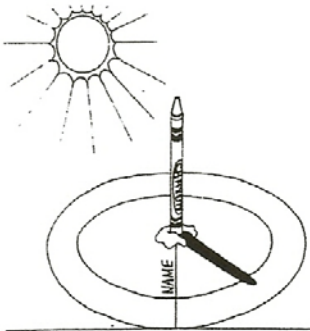
Chalk

EXPLORE:

MAKING A SUNDIAL

[S, Sun-shadows]

1. *Have Students:* Draw a line from the center to the edge of a plate.
Write their name on the line.
Stand a crayon in the middle of the plate on a piece of clay.



2. Go outside in the morning. *Have students:*
Sit on a line on the playground that gets full sunlight, facing the Sun.
Place the 'sundial' in a sunny location on this line so their name line is perpendicular to the line on the asphalt and touching it. (The teacher can mark the location of their sundial by extending the pencil 'name' line onto the asphalt with chalk and placing their initials on the chalk line.)
Students always return to the same spot and align this chalk line with the 'name line' on their plate before marking the shadows. (Because sundials may blow away, students mark their spot and do not leave the sundial outside.)

3. *Have students:* Trace over the shadow that the crayon or straw makes, making the traced line the same length and width as the shadow. Write the time they traced this shadow on top of the area they marked on the paper plate.
4. Place the 'sundial' plate in the same position several times during the day, marking the shadow's *length and location* and writing the time of day in the shadow's outline (a crayon makes a thick shadow).
Discuss how the location and length of the line change relative to the Sun's location. [The Earth rotates (turns) during the day, making the Sun appear to move.]

- Put the 'sundial' plate in the same spot next week.
Are the shadows in the same places?
(No, the Earth moved relative to the Sun in its orbit through space.)

MATERIALS:

For Each Pair;

1 small piece of chalk

EXPLORE 2:

SHADOW CHANGE DURING THE DAY

[S, sun-shadows]

Have students:

- Put a chalk 'X' on the playground at a spot that remains in the Sun.
Have their partner stand on the 'X'. Draw his/her shadow in chalk.
Measure the shadow's length in centimeters and record it on paper.
- PREDICT:** (Ask students to write an answer) [S, predict]
Will the shadow be longer or shorter in 2 hours? Explain your answer.
Discuss predictions and reasons for each prediction.
- Draw the person's shadow in chalk 2 hours later on the same spot.
Measure this shadow.
How has the shadow's size and shape changed.
What is the position of the Sun now? (lower in the sky?)
- Discuss the Earth's rotation and illustrate it with a globe and a ball to show the Sun. We are rotating, alternately facing the Sun and facing away from the Sun, causing day and night. This makes the Sun appear to move across the sky. The Earth rotates once in 24 hours.

DEMONSTRATE 1:

Use a playground pole as your shadow maker and draw a chalk line over its shadow on the playground, labeling the time of day on the line. The line should show the direction and length of the shadow. Check each day for 2 weeks at the same time to see if the shadow still "tells time."

DEMONSTRATE 2:

WHERE IS NORTH?

[S, sun-shadows]

FINDING TRUE NORTH USING THE SUN

Using a pole on the playground, make a chalk mark showing the direction and *length* of its shadow at 11:45 am. (12:45 pm during daylight savings time)

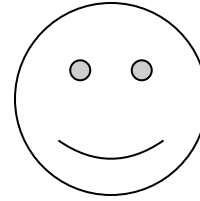
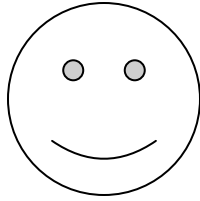
Make a mark every 5 minutes during the next 30 minutes.

The shortest mark points to true North, as the Sun is directly to the South at its highest point in the Northern Hemisphere.

(This is true North, not magnetic North that the compass points to.)

MY SHADOW HOMEWORK

Draw yourself twice in the box below. Use the oval for your head. Cut out the 2 self-portraits.



Tape the feet of the pictures in the boxes, on the left (over the words).

Make each drawing 'stand up' on the paper.

Go outside to a sunny spot. Stand the picture up so it makes a shadow in its box on the paper. Trace over the shadow to show its positions, size, and shape. Do this again later on the same day.

Predict how the shadow will look at lunch time: (circle one) tiny short long very long

Go outside to a sunny place. Time _____

**Tape the
Feet
Of
Your
Self-
Portrait
Here.**

Predict how the shadow will look late in the day: (circle one) tiny short long very long

Go outside to a sunny place Time _____

**Tape the
Feet
Of
Your
Self-
Portrait
Here.**