Outside Still Open - Shadow Mapping

Age Range	Location	Length of Time	Adult Involvement	Benefits
5–14 years old	Backyard, urban, park or nature area	1–4 hours	Low	Science skill development

Objective
In this lesson, students will be able to record data on how their shadows change position throughout the day and apply data to hypothesize the relative movements of the sun and earth.

Materials & Preparation
Variation I: A basketball court: sidewalk chart and a surface that you can draw on
Variation II: A dirt area: a stick and a dirt surface, rocks to mark where the feet are
Variation III: A beach: feathers, rocks, sticks or beach debris to mark where the feet and head are

Background Information
The Earth rotates on its axis, making one complete revolution in about 24 hours (actually 23.56). This accounts for the appearance of the sun's movement, and the movement of a kid's shadow (it's actually the Earth spinning). The sundial does not match exactly with our clock time, because we account for seasonal changes by doing an adjustment twice a year (daylight savings time) whereas the Earth is moving in its orbit around the sun every day, causing the sunlight to hit the Earth at a slightly different angle each day (shortening and lengthening of the shadows).

Sources to Learn More
Windows to the Universe. National Earth Science Teachers Association, 2012. Web. 14 Sept. 2012.

Introduction
Have your child find their shadow. What causes your shadow? Do you always find your shadow in the same place in relation to where you are? We are going to experiment with this to see how our shadow changes throughout the day.

Procedure
1. Have each kid pair up with another individual or their adult and find a place to stand with enough room to see their entire shadow.
2. Have each kid trace or otherwise mark their partner's or adult's feet on the ground. Then, have them trace their partner's entire shadow, or mark the top of their shadow's head, extending from their partner's feet.
3. Ask kid/s to predict where their shadow will lie in one hour, then to mark it, the feet will remain in the same spot.
4. Return to the same spot in one hour (or other specified amount of time). Make sure the time you choose is enough time elapsed for it to be obvious that the shadow has moved.
    a. All should observe, then make a new prediction on where the shadow will be at a given time (1 hour from now? 3 pm? etc.)

5. Depending on time, either return again to analyze, share your results, and conclude the activity. Or, conclude the activity at this point with a pair or group sharing of predictions, results, and the scientific reasons for their observations.

Debrief

How did you come up with your prediction?

Did you need to change your prediction after the first test (first returning measurement of your shadow)?

Why did your shadow move?

Make more predictions about shadow placement. Where would your shadow be in the evening?...in the morning?

Variations & Additional Activities

You could have students develop the procedure. Have them come up with how they are going to test their hypothesis or prediction. You could let each group even develop their procedure separately to see if they all do something similar to above or if they decide to test in another way. When you debrief, discuss what made an experiment effective.

Converse with your kids or engage them in activities that help them to understand the elements of our galaxy, the difference between stars, planets, moons and other satellites. Your curiosity is their curiosity.

Sources

Rey, H.A. The Stars. New York: Houghton Mifflin, 1997. Print.