



Shadow Sticks

Grade 2

Standards

S2E2 a, b

Time

45 minute - 1 hour

Supplies

(one per child)

- Paper plates
- Bamboo skewers or sharpened pencils
- Writing utensils
- Compass
- watch

Overview

Students will investigate the position of the sun in relation to the school garden (or a fixed location being considered for a school garden); make a personal shadow stick and note the position and length of the shadow during different times of day; demonstrate how time of day can be estimated without watch or clock, just as cardinal directions can be estimated without a compass.

Engagement: Sunflower

Cover clocks in the classroom all day. Take students outside for this lesson and ask them to work in teams to estimate the time of day without using clocks or watches. Groups should present their answers and challenge each other's claims by asking what evidence they used to come up with their time estimate (e.g. schedule or routine, position of sun in the sky, hungeriness or body function)

Exploration: Shadow Sticks

- To make shadow sticks, each student will take a paper plate and fold it in half to form a half circle; then in half again to form a quarter circle. When the plate is opened back up, the intersection of the fold lines is the center point. Students should place the plate on the ground in an open area of the schoolyard or garden and pin it in the center by staking the bamboo skewer or sharpened pencil into the plate and the soil below.
- Students should draw the shadows they see and note the time next to the shadow, revisiting the shadow stick at various times during the day. (This can be repeated several days, if weather allows the plates to remain outside.)
- Let students see a compass so they can mark cardinal directions on plates.
- Engage students in discussion about any patterns they noticed, in the direction and length of shadows at particular times of day, as well as the position of the sun at the same times. After students have made their claims regarding these questions, ask how they could devise an experiment to prove or provide evidence in support of their claim. (For instance, a student may propose to go outside at noon and see if the

shadow length and direction, as well as sun position, were as s/he predicted). In this process, students will discover that shadows are caused when something blocks the light of the sun; that shadows point towards the opposite direction from the position of the sun (so when the sun is in the east in the morning, shadows point to the west, and vice versa); that shadows are shortest at noon and longest near sunrise and sunset; and that (for the northern hemisphere) shadows at noon point due north).

- Given all they have learned about how shadows can reveal the time of day (by length) and the direction (by where the shadow points), take a final look at the shadow sticks and issue a challenge. If someone were lost in a meadow or open area, and knew they needed to walk north to get home, how could they find their way? And if someone did not have a watch and needed to know when to walk home from a friend's house if they were supposed to leave by 4:00 pm, how could they estimate the time from a shadow stick? If a class wanted to dig a garden in an area where they could plant flowers that prefer morning sun and would fry in afternoon light, on which side of the school building should the garden be located? (The building, in this case, serves as the shadow stick).

Teacher Resources

Shadow Stick Project Web Site: <http://sunship.currentsky.com/2005/stick.html>