How do our shadows change?

Shadow chalk drawings throughout the day

1-ESS1-1 Use observations of the sun, moon, and stars to describe patterns that can be predicted. Clarification Statement: Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars, other than our sun, are visible at night but not during the day.

Materials:

- Sidewalk chalk
- Area for tracing shadows throughout a single day (parking lot, sidewalk, playground blacktop, etc.)
- Camera (optional)
- Student science notebook or journal or recording page

Big Idea: Patterns of the motion of the Sun: positions of the Sun throughout the day

Guiding Questions:

- How do our shadows change throughout the day?
- Why do our shadows change throughout the day

Overview of exploration: Students will observe how a shadow changes during different times of the day by tracing a student's shadow in the morning, midday, and in the afternoon.

Two versions of the exploration are provided: exploration with student partners; exploration as whole class. The exploration with student partners will need a large area for tracing all students' shadows. The whole class exploration will need a smaller area to trace one person's shadows.

Previous experiences/learnings: Students should have some experience with the ideas of day and night, as well as some explorations in where we see the sun throughout the day. This lesson extends on the idea that the position of the sun changes throughout the day, and students will make connections that because the position of the sun changes, our shadows will change too.

Exploration: (with student partners)

1. Review some of their previous experiences with the sun throughout the day. Pose the question: *Do our shadows change throughout the day?* Allow students to consider this question and offer some initial thoughts.
2. Introduce the shadow exploration:
    - Share with the students that you will be exploring what shadows look like at three different times of the day today.
    - Explain that each student will have a shadow partner that will assist them in tracing their shadow. (these will be labeled as partner A and partner B in exploration)

3. Take the class outside for the first tracing in the morning.
    - Ask each of the Shadow Partner A's to spread out across the large area (they will need have space to trace their shadows throughout the day).
    - Have Shadow Partner B trace the outline of Partner A's shoes, then write that student's name inside the tracing. They will use this tracing as their foot placement for all the tracings today.
    - Have Partner A stand in the outline of their shoes while Partner B traces the outline of their shadow. After the shadow has been traced, Partner B will label it inside the tracing with the time.
    - Repeat these steps for Partner B.
    - You may want to capture their shadows and tracings in photos that you can use during discussion later.
4. After this initial tracing, have students predict what they think their shadow will look like around lunchtime. You may want to record their thoughts on a class prediction chart or student journal/notebook or use the included recording page.
5. Return outside for the second tracing midday and repeat the steps completed in the morning.
6. After the midday tracing, discuss the changes they observed from the morning to midday. Record their observations in a class chart. Ask: *How did your shadow change from the first tracing to the second tracing? Why did it change?*
7. Have students predict what they think their shadow will look like later in the afternoon. You may want to record their thoughts on a class prediction chart or student journal/notebook or use the included recording page.
8. Return outside for the final tracing in the afternoon and repeat the steps completed in the first two tracings.
9. After the final tracing, discuss the changes they observed with all of their tracings. Record their observations in a class chart. Ask: *How did your shadow change from the second tracing to the last tracing? How did your shadow change throughout the day? Why did it change? Do you think your shadow changes like this each day?*
10. Have students share their thinking and complete their recording sheets or record their observations in their science notebooks.

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Exploration: (as whole class)

1. Review some of their previous experiences with the sun throughout the day. Pose the question: *Do our shadows change throughout the day?* Allow students to consider this question and offer some initial thoughts.
2. Introduce the shadow exploration:
    - Share with the students that you will be exploring what shadows look like at three different times of the day today.
    - Explain that you will be tracing the shadow of a student or have a student trace your shadow throughout the day. (referred to as "subject" in the description below)
3. Take the class outside for the first tracing in the morning.
    - Trace the outline of the subject's shoes to use as foot placement for all the tracings today.
    - Traces the outline of the subject's shadow. After the shadow has been traced, label it inside the tracing with the time.
    - You may want to capture this with a camera to use for discussion and explanation purposes later.
4. After this initial tracing, have students predict what they think the shadow will look like around lunchtime. You may want to record their thoughts on a class prediction chart or student journal/notebook or use the included recording page.
5. Return outside for the second tracing midday and repeat the steps completed in the morning.
6. After the midday tracing, discuss the changes they observed from the morning to midday. Record their observations in a class chart. Ask: *How did the shadow change from the first tracing to the second tracing? Why did it change?*
7. Have students predict what they think the shadow will look like later in the afternoon. You may want to record their thoughts on a class prediction chart or student journal/notebook or use the included recording page.
8. Return outside for the final tracing in the afternoon and repeat the steps completed in the first two tracings.
9. After the final tracing, discuss the changes they observed with all of the tracings. Record their observations in a class chart. Ask: *How did the shadow change from the second tracing to the last tracing? How did the shadow change throughout the day? Why did it change? Do you think shadows changes like this each day?*
10. Have students share their thinking and complete their recording sheets or record their observations in their science notebooks.

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Name: _____

Draw what your shadow tracings looked like throughout the day. Be sure to label each one with the time of the tracing.

How did your shadow change throughout the day? Why did it change?