



BIG IDEA:

The earliest design of the sundial dates back thousands of years. They are one of the oldest known instruments for measuring time. The concept of measuring time using the sun and shadows can be traced to ancient civilizations such as the Greeks, Egyptians, and Babylonians. The first sundials were made of stone pillars that cast a shadow onto the ground. Later sundials included a shorter gnomon (the part that casts a shadow), pointed north, and were different shapes. Student's understanding of the history and evolution of sundials and connection to current time telling tools can help them consider how science and technology has changed daily life.

OBJECTIVES:

Students will understand the sun is a source of light and energy.

Students will design sundials out of simple materials and observe patterns, shadows, and changes the sun's light makes as the Earth rotates around the sun.

Students will consider how ideas and technology have contributed to the evolution of tools we use in our daily life.

Students will understand how the position of light changes the size and position of a shadow.

FOCUSED LEARNING STANDARDS:

(K) K.ESS.2-The moon, sun and stars can be observed at different times of the day or night.

(K) History 1-Time can be measured.

(1st Grade) 1.ESS.1-The sun is the principal source of energy.

(1st Grade) History 1-Time can be divided into categories (e.g., months of the year, past, present and future)

(2nd Grade) History 3-Science and technology have changed daily life.

MATERIALS:

Chalk, ruler or tape measure, clock or watch, science journal or documentation sheet

KEY VOCABULARY:

Sundial, sun, shadow, time, pattern, change

STEPS:

- 1) Set the stage by reading books that will help students make connections and continue to build upon background knowledge. A few anchor texts include: *Sun Up, Sun Down* by Gail Gibbons, *What Makes a Shadow* by Clyde Robert Bulla, and *The Sun is My Favorite Star* by Frank Asch. Remind students that the sun is the closest star to Earth and it's the source of heat and light for us.
- 2) With students, discuss the importance in telling time and the importance in the invention of clocks. Before watches and clocks, people determined the time by using a sundial, the oldest known instrument for telling time. Ask students to compare the time telling tools.
- 3) Choose a time in the morning to take students outside. Have small groups of students draw a human sundial. Start by drawing a large circle. Make evenly spaced marks around the outside edge for each hour of the day. Encourage older students to include the numbers found on a clock and mark the center of the circle.
- 4) Have a student from the small group stand on the center mark. A peer can trace where the shadow falls on the sundial. Mark the time on the shadow using a watch or clock. Have students measure the shadow using a ruler or tape measure and record in a science journal or documentation sheet.
- 5) Repeat at noon and later in the afternoon, marking the time in the shadow tracing.
- 6) Ask students to record their thoughts in a science journal or documentation sheet.

DISCUSSION:

Ask students the following reflection questions:

- Looking at your shadow observations throughout the day, how do you think a sundial helps people tell time?
- How do you think the shadows might change from season to season?
- Additionally, how is the sun important to us?
- What do you think about the evolution of time telling tools? Is it easier or more difficult to tell time now?

Sundials work because as the Earth rotates around the sun, the sun's place in the sky changes. A shadow is cast by the gnomon on the sundial as the Earth rotates and people can roughly estimate the time of day by observing the shadow as it changes location.