

I. Lesson Title

Learning and Constructing Sundials

II. Lesson Objective(s)

SWBAT construct a working sundial to understand how time coincides with the rotation of Earth on its axis.

III. Language Objectives

Throughout the lesson students will be able to use proper content vocabulary words to explain how a sundial works both orally and in written form.

IV. New Jersey Student Learning Standards

NGSS- 3-5-ETS1-3 - Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

IV. Learning Tasks/Activities

1. First the students will complete a KWL chart about how much knowledge they have about telling time and sun movement. Discuss how we tell time today, different methods of telling time, keeping records of time, and how they made the very first clock and how it was set.
2. Teacher will discuss and demonstrate how the Egyptians used the sections on their fingers to count the different segments of the day as they observed the sun's movement throughout the sky.
3. Teacher will show a quick video showing the movement of the sun across the sky and the shadow movements on the ground. They will discuss how those shadows measure the sun's position in the sky. The sun's position coincides with the time of the day. This discussion will lead to the introduction of the first clock, the sundial.
4. The teacher will introduce the STEM Lab directions and materials that will be used during the lesson. The teacher will also cover safety rules.
5. Students will first break into groups of four and gather their materials.
6. Sundial Construction
 - a. Step 1 – Using a ruler, make a giant “plus” sign or cross on their paper plate.
 - b. Step 2 - Label the points of the cross with the cardinal directions – N, E, S, & W (North, East, South, & West).
 - c. Step 3 – Cut-out the shadow clock template and glue it onto your plate. Make sure the point of the template faces North.
 - d. Step 4 – On your shadow clock template, find the current month. Place a small piece of clay or play dough on the current month. Then, push the toothpick through the small amount of clay. Make sure that

the toothpick is straight, not slanted. Now your sundial has been created.

7. Once all sundials are made, the teacher will point out the direction towards the geographic North Pole. Students will turn their sundial so that the North direction on their sundial matches where the geographic North Pole is in the classroom.
8. Teacher will then demonstrate how to use a flashlight to cast a shadow from the toothpick onto the sundial, and explain how the position on the flashlight (sun) determines the time of the day.
9. Students will be given time to explore the relationship between the flashlight's (sun's) position and the length of the shadows. Students discuss in their groups about the different shadows casted on the plate determined by the position of the flashlight moving around the sundial.
10. Students will then be able to explore, discuss, and complete their STEM Lab worksheet.
11. After the experiment is completed, pick a sunny day and allow students to use their sundial outdoors to tell time.

V. Assessment

Teacher Observation

STEM Lab Worksheet

VI. Tools/Materials

stiff white paper plate 10"	clay/play dough	1 toothpick	shadow clock template
pencil	scissors	glue / tape	ruler

Name: _____

Date: _____

Sundial STEM Lab Worksheet

Directions: Use your sundial and other materials to answer the following questions about the sundial STEM Lab. Be sure to use your lesson vocabulary words, and write your answers in complete sentences.

1. Which side of the plate is your flashlight on when the shadow tells you it's morning?

2. Where is the sun in the sky in the morning? (Please use your cardinal directions when describing your answer.)

3. Which side of the plate is your flashlight on when the shadow tells you it's evening?

4. Where is the sun in the sky in the evening? (Please use your cardinal directions when describing your answer.)

Name: _____

Date: _____

Sundial STEM Lab Worksheet cont.

5. Can you make the clock go from 6 AM to 6 PM? What did you do with the flashlight/sun to make that happen?

6. What time is it? Move your flashlight until your sundial matches the real time. If you could look through the ceiling right now and see the sun, where would it be?
