

Solar Buddies

Topic: Sunlight causes shadows which change throughout the day.

Suggested grades 2-3

Target standards - Grade 2

Materials/Resources needed:

- Sidewalk chalk
- Class set of compasses

Optional:

- Butcher paper
- Markers

Prep time: 10 minutes

Lesson time: 1 hour over one day

Teacher-guided templates: 10 minutes

Language arts activity: 30 minutes (optional)

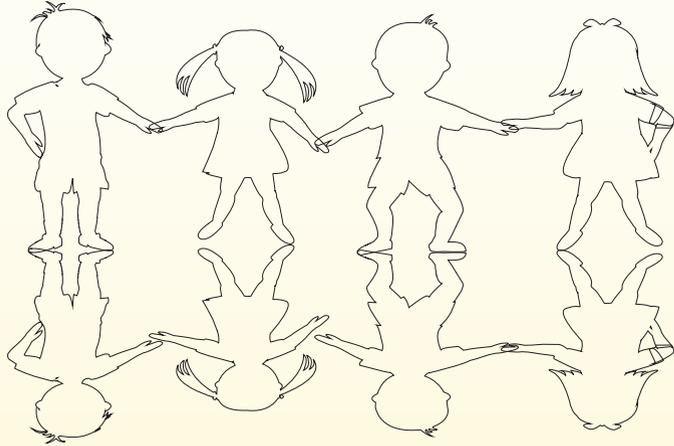
Outcome: Students learn about the movement of the sun across the sky, shadows and gain an elementary understanding of cardinal directions.

Standards:

In appendix

Vocabulary:

In appendix



Prep



- Discuss with administration the use of the blacktop area in the school's playground.
- If your school does not allow chalk on the blacktop or a surface is not available, tear off kid-sized pieces of butcher block paper prior to the activity (optional).

Engage



- Introduce the topic of the sun by reading [The Sun is My Favorite Star](#) by Fred Asch. The main character is a child and the narrative follows that child's experiences with the sun through a day.
- Over a few days or a week, ask the students to observe and write on the board the observed position of the sun as it relates to the classroom during 3 time periods: first thing in the morning, lunch time and just before going home. Use a fixed object for the observations, for example: a tree or playground equipment if you would rather have the students draw their observations.
- Encourage students to note that the sun follows the same path or direction across the sky.

Teach/Build



- Ask students what they already know about shadows.
- Tell students that they will be drawing their shadows. (They will be drawing their shadow outlines three times in a day: Once in the early morning, late afternoon and close to noon and late afternoon.)
- Ask students to predict what their shadow will look like.
- Inform students that the sun rises in the east and sets in the west.
- Share the song Cardinal Directions [youtube/f2l81_BFb-s](https://www.youtube.com/watch?v=f2l81_BFb-s) or any other song or poem relating to cardinal direction.

Activity



1. Choose a sunny (but not too hot of day) and prepare three testing times: early morning, lunchtime and late afternoon. Space the students well apart and make sure the body tracings are not too close together as all students will have (3) body outlines at the end of this activity.
2. Demonstrate how to trace a person's shadow using another teacher or student.
3. Early morning
 - a. Have students partner up.
 - b. Go to a blacktop where it will be safe for the students to work in pairs.
 - c. Have them note where the sun is positioned in the sky.
 - d. Instruct each team to have Student #1 stand directly facing the sun and move their arms out slightly.
 - e. Have Student #2 put an X by Student #1's feet to mark their standing position and write the initials of Student #1. (If activity is done on Butcher Paper, stand on edge and write initials on lower right hand corner.)
 - f. Have Student #2 trace Student #1's shadow with chalk on the blacktop.
 - g. Have the students change places and repeat steps d - f.
4. Noon
 - a. Repeat steps a-g, using the same pairs of students, making the second student drawing close to and in alignment with the original drawing so that it is easy for the students to observe and draw comparisons. Be sure to leave space for the last drawing.

5. Ask students to look at the drawings of their shadows. Are they different? Why?
6. Ask students if the sun's position has changed. Did this affect the shadow?
7. Late afternoon
 - a. Repeat steps a-g making the third student drawing close to the original drawings so that it is easy for the students to compare and draw comparisons.
8. Remind the students that the sun rises in the east and sets in the west.
9. Demonstrate a compass and give each pair of students one compass for examination.
10. Using chalk, draw a sample compass rose on the blacktop using a compass as a guide.
11. Instruct the students to draw their own compass rose by their blacktop bodies and marking the cardinal directions of north, south, east and west. (N,S,E and W)

Explore



- While the students are in line for recess or some other outdoor activity, ask them to notice their shadow throughout the day.
- Later, have them volunteer what they noticed about their shadows. Write responses on the board.

Assessment



Students apply their learning by drawing a compass rose on the blacktop and by drawing an accurate description of the activity on the student worksheet.

Crossover



- Encourage students to write a poem about the movement of the sun or shadows.
- Have students color in their shadow body outlines on the blacktop with colored chalk.
- Play some songs about shadows or the cardinal directions.

Accommodations and Extensions



- Encourage English language learners to share the cardinal directions in their language on the blacktop.
- Make accommodations for students who are physically limited by giving them chalk on a stick which will avoid having to kneel on the ground. This is available online or toy stores.

Anticipated Misconceptions



- Students may think that shadows always appear the same.
- Students may think that shadows are disconnected from the body.
- Students may not know that the sun does not move in a regular predictable pattern.

Safety



- Tell the student NEVER to look directly at the sun.

Front Loading



Read one or more of the following books:

The Sun is My Favorite Star by Frank Asch

The Sun: Our Nearest Star by Franklyn M. Branley

Why the Sun and Moon Live in the Sky by Elphinstone Dayrell

The Sun is Always Shining Somewhere by Allan Fowler

Sun Up, Sun Down by Gail Gibbons

The Sun by Seymour Simon

MoonBear's Shadow by Fran Asch

Shadow Play by Bernie Zubrowski

My Shadow by Robert Louis Stevenson

References



Eye in the Sky – NASA

http://www.eyeonthesky.org/lessonplans/04sun_shadows.html



Additional References and Digital

Why do I have a shadow?

https://youtu.be/6dQmGzq_3R0

Crash course on the sun movement

<https://youtu.be/1SN1BOpLZAs>

How the sun “moves” through the sky

<https://youtu.be/Md4XC9jWVcc>

Apparent movement of the sun

<https://youtu.be/3Jfb-M4d71g>

Appendix



Standards

1-ESS1-1 Earth's Place in the Universe K-2

Use observations of the sun, moon, and stars to describe patterns that can be predicted.

Common Core State Standard Connection

- Mathematical practices.
- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

Vocabulary

Cardinal directions - The cardinal directions are north, south, east and west.

Compass rose - A circle showing the principal directions printed on a map or chart.

East - The direction toward the point of the horizon where the sun rises at the equinox.

Light - Stimulates sight and makes things visible.

North - The direction in which a compass needle points.

Shadow - A dark area or shape produced by a body coming between rays of light and a surface.

South - The direction toward the point of the horizon 90° clockwise from east.

Sun - The closest star to the Earth.

West - The direction toward the point of the horizon where the sun sets at the equinox.