LESSON PLAN

Unit Title: Keeping It Cool With Solar

Lesson #1: Hot Spot/Cool Spot

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DESCRIPTION

This is the first lesson where K-2 students will investigate the effect of sunlight on the earth's surface (K-PS3-1). The students will observe a video of an ice cube melting as the anchoring phenomenon for the unit. In this first lesson, students will explore the playground areas to observe hot and cool areas, and how they correlate to sun and shade.

GRADE LEVEL(S)

This lesson focuses on Kindergarten. However, the unit integrates K-2 ETS standards in later lessons.

SUBJECT AREA(S)

sunlight, solar, kindergarten, earth's surface

ACTIVITY LENGTH

One 30-minute lesson

LEARNING GOAL(S)

1. Students will consider and pose questions about what type of energy source can cause an ice cube to melt.
2. Students will explore how the sun affects the Earth's surface on the playground.
3. Students will analyze data to understand how the sun affects the earth's surface on the playground.
4. Students will link the idea of sun/shade to hot/cool.

CONTENT BACKGROUND

STUDENT BACKGROUND

- Students should be familiar with light/shade and hot/cool dichotomies.
- Students should be aware that the sun can be a source of heat energy.

EDUCATOR BACKGROUND

- While this unit is geared toward primary students, teachers know that primary students come up with the best and hardest questions. Please make sure you review the following at CE's Teacher Learning Center: https://www.cebrightfutures.org/learn/fundamentals-energy
- Sunlight itself is not hot, it is only a form of energy called electromagnetic radiation (a form of energy that exists in waves and includes visible light, radio waves, UV and infrared light among others. most of which are invisible to our eyes). When light energy interacts with matter (like the air, a surface, or our skin), it can be transformed into heat energy, a form of energy based upon the vibration of molecules. This is why we feel heat in the sun.
- Due to the rotation of the earth, the sun is at a different point of the sky during the day as it "travels" from east to west, and across the seasons as it "moves" from higher in the sky during summer to lower in the sky during winter. This means shadow change regularly during the time of day and time of year.
- This lesson sets the stage for students to engineer a structure that will keep the earth's surface cool.
- The video of an ice cube melting can foreshadow the upper elementary and middle school concepts of snow and ice melting and seasonal and climate temperatures rise.

MATERIALS NEEDED

HANDOUTS/PAPER MATERIALS

- Playground Picture from lesson materials
- A Picture of your school's playground

CLASSROOM SUPPLIES

- Markers - red for hot, blue for cool
- Blank/recycled paper for drawing
- Drawing materials

ACTIVITY SUPPLIES (PER GROUP OF 3-4 STUDENTS)

- Video of ice cube melting: https://www.youtube.com/watch?v=cETW5VagwtM

LESSON PROGRESSION

PLANNING AND PREP:

This lesson is designed to span three 10-minute sessions.

First 10-minute session: Watching videos and predicting hot/cool areas of playground.

Cue video: https://www.youtube.com/watch?v=cETW5VagwtM

Second 10-minute session: Exploring hot and cool spots on the playground.

Print handouts, one per student

Have blue and red markers available for each student.

Third 10-minute session: Analyzing data

Prepare paper to draw or write on for students to record their findings of how hot and cool spots correlate to sun/shade spots.

LESSON SEQUENCE

SESSION 1: INTRODUCE PHENOMENON

1. *(10 min.) Show YouTube video "102 - Ice Cube Melting - Time Lapse Photography" by Len Whistler of ice melting and ask students what is causing the ice melt? Where does the energy come from that makes the ice melt?*
2. *Students should have a concept that the ice is melting from heat, and that the sun is a source of heat.*
3. *(5 min) Hand out the example playground picture and ask students to mark an "x" in red for areas where an ice cube would melt quickly, and a blue "x" where an ice cube would melt the slowest. Check for understanding that the shaded areas are blue and the sunny areas are red.*

SESSION 2: EXPLORE THE EFFECT OF SUN ON THE EARTH'S SURFACE

4. *(10 min) Hand out a picture of your school's actual playground and markers. Take students out to playground to feel different surfaces and record which surfaces are hotter and cooler on their worksheet by circling the area with a red marker (for hotter) and a blue marker (for colder).*
    a. *Note: temperature differences between shaded and unshaded areas may be small, and "cold" areas may still be very warm. Instructions should be understandable to your students to distinguish "cold" from relatively cold. This could also be discussed in a spectrum from "very hot" to "hot" to "warm," for example.*

SESSION 3: ANALYZE DATA OF HOT SPOTS AND COOL SPOTS

5. *(10 min) Have students look at data collected outside and ask them to notice if the hotter spots were in sun areas or shade areas, and if cooler spots were in sun or shade areas. Students should be able to compare this with their prediction that the shade areas of the playground are cooler than the sunny areas.*
6. *Students can write or draw conclusion on the worksheet or separate sheets of paper.*

ASSESSMENT AND EXTENSIONS

FORMATIVE ASSESSMENT

The formative assessment is when students mark down the hot and cool spots and give reason why they marked each area of the playground on their paper.

SUMMATIVE ASSESSMENT

Students verbally and write/draw their conclusions of why hot spots are in sun areas of the playground and cool spots are in shade areas of the playground. Students should be able to verbalize that the sun heats up the playground surface.

LESSON EXTENSIONS

Science Friday has a multitude of resources that expand the notion of ice or glaciers melting due to climate becoming warmer (https://www.sciencefriday.com/spotlights/ice-science/).

This SciShow Kids video (https://www.youtube.com/watch?v=d1Kc8Jeu4yY) has an engineering challenge of keeping a snowman from melting. This is a precursor to the engineering challenge for this unit.