Unit Title: Keeping It Cool With Solar

Lesson #6: Add Solar Panel Redesign, Rebuild, Retest

AUTHOR:
Mark Lewin
Teacher Contact: mlewin@eesd.net
CE Editor Contact: CEdbrightfutures@b-e-f.org, 503-553-3949

DESCRIPTION
This lesson is designed for one 60-minute session. Students will share and discuss results. Students are shown solar panel and fan and are asked, “Using solar technology, how might we make the ground in our structures even cooler?” Using the solar panel and fan, students are allowed to rebuild and measure the ground in their structure. They record the temperature of the ground in their structure.

GRADE LEVEL(S)
K-2

SUBJECT AREA (S)
Engineering design, structure

ACTIVITY LENGTH
One 60 minute session

LEARNING GOAL(S)
1. Students build shade structures that will optimize cooling the earth’s surface from sunlight, incorporating solar energy.

CONTENT BACKGROUND

STUDENT BACKGROUND
- Students should be able to:
  - Ask and/or identify questions that can be answered by an investigation.
  - Able to build a structure using various objects.
  - Recognize and compare numbers 1-100.
LESSON PLAN

EDUCATOR BACKGROUND

● Be experienced with using an infrared thermometer.
● The educator will have in mind various structures that students will have success in designing.
● The educator should know the difference between opaque and translucent, and explain the difference in terms of blocking and allowing sunlight.

MATERIALS NEEDED

HANDOUTS/PAPER MATERIALS

● Time Lapse of solar panel parking structures - https://www.youtube.com/watch?v=WgjksZoznuA
● Observation worksheet/thermometer handout (either new or student’s previous handout)

ACTIVITY SUPPLIES

● Structure previously built
● 1.5 x 500 mAmp Solar PV panel with alligator clips (1 per group)
  ○ https://sunwindsolar.com/solar-photovoltaic-panels/
● 1.5+ V DC motor (1 per group)
● Propeller for motor (1 per group)
  ○ https://www.amazon.com/EUDAX-Propeller-Airplane-Science-Education/dp/B073XL73F6/ref=pd_bxgy_21_img_3/136-5581566-53880332_encoding=UTF8&pd_rd_i=B073XL73F6&pd_rd_r=e8bec84b-f914-4da5-a569-b1fa851a89ee&pd_rd_w=qz5OM&pd_rd_wg=UuULA&pf_rd_p=a2006322-0bc0-4db9-a08e-d168c18ce6f0&pf_rd_r=8T0JE6VVSC7CQ5CKSD&qid=1&refRID=8T0JE6VVSC7CQ5CKSD
● Infrared thermometer (1 per class)
● Optional: Liquid Crystal paper for visualizing heat changes
  ○ https://www.sciplus.com/liquid-crystal-temperature-sheet-3676-p7gclid=EAiaiQobChMlp42cys-r5AlVFL3sCh3XagqcEAQYASABEglISSPD_BwE

LESSON PROGRESSION

PLANNING AND PREP

This lesson is one 30-45 minute period. Teacher needs to make sure s/he has students’ structures from previous lesson. Teacher needs to make sure video link works to show video.

Students need design worksheet from Lessons 5.

LESSON SEQUENCE
1. **(10 min) Phenomenon:** Show students phenomenon of video showing a time lapse of a solar structure being built (https://www.playposit.com/listcode/1016224/c40b12/open/anonymous). Ask the question: “What are some different ways we can use this solar panel to make the ground in our structures even cooler?”

2. **(30 min)** Have students add to their structure incorporating their solar panel and motor fan. Pass out students’ observation worksheet/thermometer handout (can be the same one as Lesson 5 or a new one).

3. **(15-30 min)** Have students put structures out in the sun with solar panels and fans. Measure and record the temperature using the infrared thermometer and data sheet.

4. **(5 min)** Students will verbalize temperature differences and “graph” the relative temperatures on their thermometers.

**ASSESSMENT AND EXTENSIONS**

**FORMATIVE ASSESSMENT**
As students build, have students explain their reasoning for how the solar motor fan might make the structure cooler.

**SUMMATIVE ASSESSMENT**
Have students measure earth’s surface under sunlight and under their structure. Have students record temperatures and note them on the thermometer poster, with the addition of the solar panels.

**LESSON EXTENSIONS**
None.