



Drexel-SDP GK-12 ACTIVITY

Subject Areas: Physical Science, Weather, Earth Science, Technology and Society

Activity Title: Solar Powered Helicopters

Grade Level: 5 (5–8)

Time Required: 10 weeks, 2 classes/week & 1hr per class

Group Size: 4-5 students

Expendable Cost per Group: \$20.00 USD

Summary:

Students will investigate solar power model helicopters from concept, design, building, racing and then reevaluate to improve their helicopters. This activity will complement the FOSS Solar Energy unit.

Engineering Connection:

Engineers communicate in many different ways. Writing is one form of communication. In this module the students learned about communicating through writing instructions for part of their solar powered cars. This activity combines writing, math and science and can be used to augment many different activities

Keywords: Solar Energy, Energy, Solar Power, Solar Cells

Educational Standards:

Science:	3.1.5 a, d, e	Math: 2.1.5 c
	3.2.5 a, b, c	2.2.5 c, e
	3.4.5 b, c	2.3.5 a, c, e

3.1.7a,
3.1.7b
3.1.7c

2.4.5 a, c
2.5.5 a, b
2.6.5 a, b, c, e

Learning Objectives:

After this lesson, students should be able to:

- Recording observations and connecting it to physical phenomenon.
- Understand the rotation of the earth.
- Understanding the transferring of different types of energy from the sun.
- Use scientific thinking process to conduct investigations and build explanations: observing, communicating, comparing, organizing relatively
- Develop solar energy-let it naturally lead into variables and connect to ecosystem
- Learn how a helicopter works
- Learn what is the driving force behind helicopters.
- Learn the principles of scale-up
- Learn the way engineers communicate through instruction manuals.

Materials List:

Each student needs:

- Lab notebook
- Pen or pencil
- Calculator

Each group needs:

- www.sunwindsolar.com; Classroom ten pack \$134.95
- Rulers
- Piece of paper with an X in the center and North east south and west labeled
- A compass

Introduction / Motivation:

Instructions are a form of communication that both commands and explains how an action, behavior, method or task is to be started, completed, conducted or executed. Engineers routinely use instructions to provide information on how they constructed building, helicopters, shirts and most of the world around us.

Vocabulary / Definitions:

Word	Definition
Rotation	Movement of an object in a circular motion around a center (or point).
Revolution	A Ecliptic or oblate circular orbit about a fixed point
Sun	The closest star to earth

Procedure:

- Methods and Procedure:
 - @ 9:30 am the students trace their shadows in groups of three or more.
 - @ 1:30 pm the students stand in the foot print of their shadows and trace their new shadows.
 - Students write down their observations and draw a sketch of the position of their shadows at 9:30 am and 1:30 pm on a piece of paper that will become their science journal.
 - Teacher explains that as the earth rotates the position of the sun in the sky changes and that is why our shadows look different in the afternoon than in the morning.

When the students went outside in the afternoon they all noticed that their shadow changed position and related it to the sun. The most common answer was that the “sun moved.” During the lecture portion, I explained the rotation of the earth using a football and a globe. The most difficult concept to grab was that the earth moved under them from west to east, since this may be counter intuitive on first glance. The critical concept to explaining the change in shadow direction and shape was the angle that the rays of light make with the earth. Overall most students were excited about the experiment.

Students will work in teams of three to four and begin building their solar helicopters in conjunction with the FOSS solar energy kit. Instructions for are available in both kits. Students are encouraged to develop and build helicopters with out help from kits.

Before: Review components of a helicopter.

Discuss different types of energy and the common goal of energy.

During: Students will work in teams of 2 or 4. Each team will receive a letter from a fictitious company and follow those instructions. All information will be recorded on the data table.

After: Students will present to the class their designs and explain how they arrived at their final product. Students will make a collage of the different types of energy sources that can power cars. Students will submit a 1 to 3 page report that summarizes the experiment and descriptions the reason for the car's design.

As part of this exercise, instructions were given out on how to make a peanut butter and jelly sandwich see worksheet above. Proceed to go through the instructions and explain why each sentence is written and how the pictures help the reader focus and understand how to complete each task. Now that the students know what an instruction manual is, have the students write their own manual for part of the helicopter that they are working on. They must remember to explain, what parts they need and how to assemble the pieces.

Assessment:

Laboratory notebook

Activity Extensions: None

Other:

FOSS Solar Energy Unit
<http://lhsfoss.org/scope/5-6.html>

Author: Michael Birnkrant

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