Solar Car Engineering Challenge

Activity Summary:

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DESCRIPTION: Students will build a solar car using instructions provided (Sol Run). They will take measurements of their car and then test to see how fast it can travel a 3m track. After students obtain their initial results they will research how to improve the car's top speed and then design and build an improved model.

GRADE LEVEL(S): 6, 7, 8

SUBJECT AREA(S): Engineering, solar energy, renewable resources, measurement, physics

ACTIVITY LENGTH: 40 minutes

LEARNING GOAL(S): After the completion of this lesson students will be able to:

- Describe how solar cars work
- Accurately record and measure data
- Use data to propose changes to experimental designs
- Research a topic
- Complete a full engineering assignment
- Explain pros/cons of various prototypes
- Work successfully within a group to accomplish a specific task
- Brainstorm various ideas

STANDARDS MET:

Oregon:

6.2P.2	Describe the relationships between: electricity and magnetism, static and current electricity, series and parallel electrical circuits.
7.2E.1	Describe and evaluate the environmental and societal effects of obtaining, using, and managing waste of renewable and non-renewable resources.

Next Generation Science Standards:

MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

MS-ETS1-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

SCIENCE KIT MATERIALS LIST:

- Sol Run Solar Machines Kit

OTHER MATERIALS LIST:

- Extra solar panels
- Extra motors
- Various wires, clamps, wheels, etc.
- Solar car instructions
- Light (lamps or sunlight)
- Track
- Computers (for research)
- Lab sheets
- Graph paper
- Timers
- Meter sticks

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Vocabulary:

- Solar cell
- Photovoltaic
- Voltage
- Power

Student Background:

- Students should have a basic understanding of electricity and how photovoltaic modules work

Educator Background:

- It is helpful if teachers have a basic understanding of how photovoltaic modules work, the energy transformations at work:
  - Electromagnetic radiation (from the Sun) to electrical energy (occurs in the photovoltaic module)
  - Electrical energy to motion (in the DC motor)

Lesson Details:

Day 1: Intro Project, students begin building cars

Day 2: Students finish building cars, test cars, record measurements

Day 3: Research, Day 1

Day 4: Research, Day 2

Day 5: Brainstorm improvements with group

Day 6: Make proposed changes to solar car

Day 7: Make proposed changes to solar car

Day 8: Race competition (as a whole class)