STEM Connections

SunEzoon Solar Cars

Below are ideas for connecting the SunEzoon activity to STEM concepts and principles. For more ideas and detailed STEM lessons, consult the *SunEzoon Cars Teacher's Guide*.

ACTIVITY OVERVIEW

Students build and test small solar cars from a kit. The cars travel well on a smooth surface in full sunlight (best done outdoors). In the case of inclement weather, a 100 W incandescent reflector lamp can be used. Keep the lightbulb at least six inches away from the car for safety purposes.

SCIENCE

Photovoltaics

Have students build a SunEzoon car from the kit of parts. Before taking the cars outside to test them, have students verbalize what they think will happen when the car is in the sun (move forward, move backward, move sideways, won't move at all, and so on) and when the car is in the shade.

Remind students of the importance of scientific observation, and then have them test their SunEzoon cars in the sun on a smooth surface. Have the students stand so that their shadows fall on the SunEzoon car. Have them partially block the sun on the SunEzoon car.

Immediately after returning to the classroom, have students write their observations about what happened when the car was in the sun, out of the sun, and partially blocked from the sun. Have students write short explanations of what they think is occurring in the solar panel that would explain their observations.

Provide a lecture or handout about photovoltaics for the students, and have them run their cars in the sun again, observing the same scenarios as before. When they get back to the classroom, have them provide an explanation of what was happening in terms related to your lecture or handout.

ENGINEERING

King of the Hill

Student competitions can be an excellent way to bring out the engineering potential in many students. Where many students might not excel in the learning of specific content, they can excel in the practical application of concepts and principles in problem solving through hands-on activities.

With the SunEzoon solar cars, one method to encourage problem solving is to create teams of students that will combine any/all parts of their SunEzoon cars to engineer a super solar vehicle that will travel up the steepest incline.

Motors, gears, solar panels – anything within the original kits can be used to construct this vehicle. Depending on the grade level of the students, anywhere from two to five days might be spent in the design loop, with student teams keeping track of their ideas and progress in an engineering notebook.

To test the vehicles, an inclined plane (a board with increasing numbers of books under it at one end) will be the test platform for the vehicles. Vehicles continue to be tested at every increasing incline but are out of the competition when they can no longer climb the hill.

The team with the vehicle that climbs the steepest incline will be crowned "King of the Hill."

TECHNOLOGY

Using a Voltmeter or Multimeter

Have students build a SunEzoon car from the kit of parts. Have students work in teams of two to complete this activity.

Demonstrate in the classroom how to use the voltmeter, choosing a voltage range that will work with a 0.5 V output from the solar cell.

Each team will need a voltmeter (digital or analog) with leads. In full sunlight, one student will hold his or her SunEzoon car with the solar panel pointed toward the Sun. The other student will hold the test leads against the metal alligator clips connected to the motor. The black lead of the voltmeter should be touching the alligator clip with the black insulator, and the red lead should be touching the alligator clip with the red insulator.

Teams should record the voltage reading with the panel pointed directly at the Sun and at different angles to the Sun. Students should record the relative speed of the motor and wheels of the car at each angle as well.

Comparisons of the maximum and minimum voltages obtained across the class can be done, and the maximum voltage from each student team can be reported, combined and averaged to determine the average maximum voltage output.

MATH

Real-World Unit Rate

Many real-world math problems include those involved with rate; for example, if John makes $10.00 per hour and works for 4.5 hours, how much will John make? Or if a car travels 20 miles per hour, how long would it take to go 5 miles?

Have students build a SunEzoon car from the kit of parts.

Working in teams of two, students should time their SunEzoon car in full sunlight to determine how long it takes to travel two meters. The distance can be marked off by masking tape, and students can use a stopwatch or a mobile device to accurately determine the amount of elapsed time.

When the time and distance are determined, students calculate the speed of their SunEzoon car.

(Speed = Distance ÷ Time)

Teams should do at least three trials and find the average speed from the three trials.

When the speed of their vehicle is determined, they will predict (through calculations) how long it will take their SunEzoon car to travel 3.25 meters. Again, the distance can be marked with masking tape.

Teams will compare the calculated time with the actual time. If the two times are not close, they should brainstorm to determine what might be affecting the results.

PITSCO EDUCATION

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