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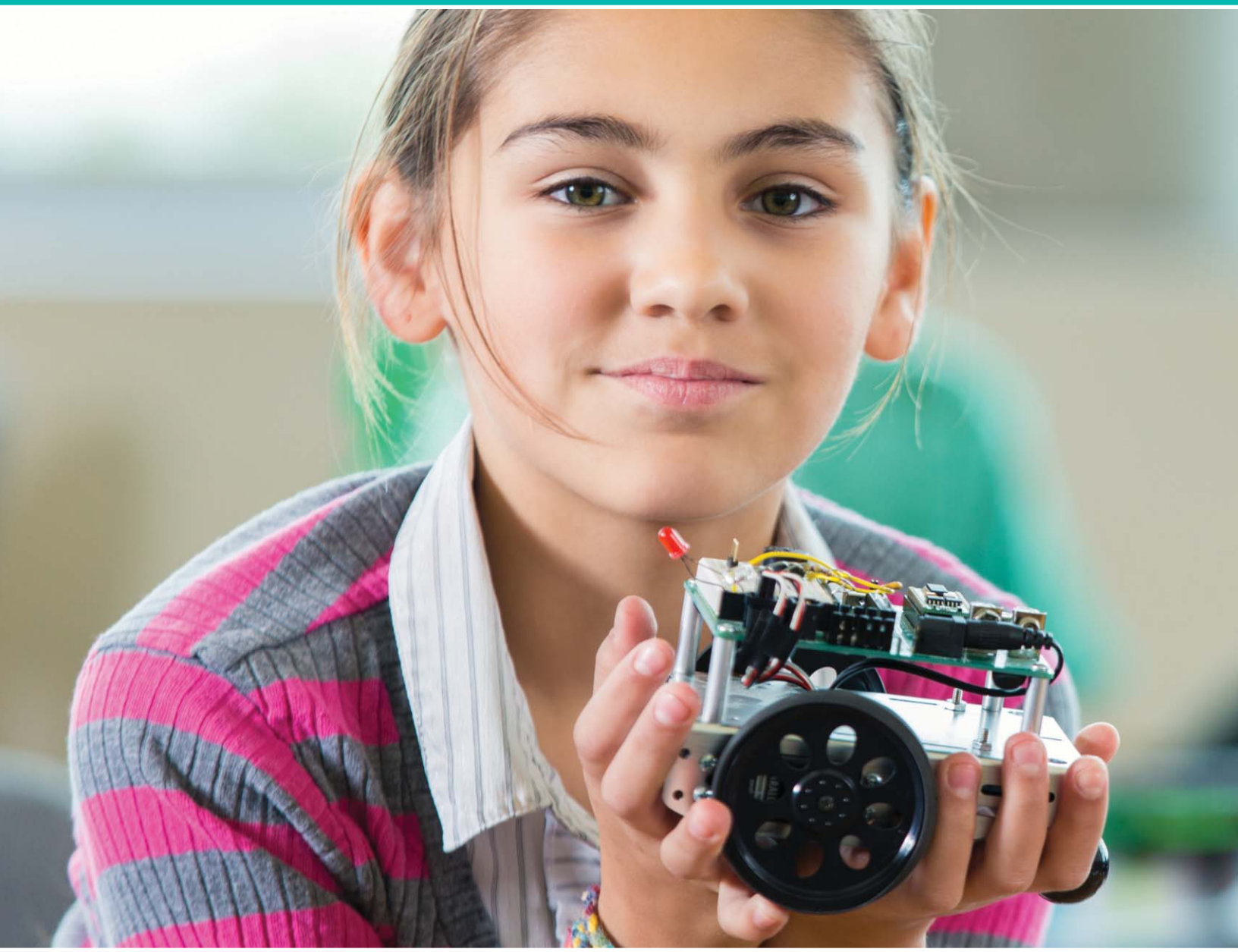
2016-2017

ideas with IMPACT



idea packet

Sponsored by:

Ford Motor Company Fund

Running on Sunshine

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Running on Sunshine

For information concerning Impact II opportunities including Adapter and Disseminator grants, please contact:

The Education Fund
Telephone: (305)558-4544, EXT. 113
E-mail: elau@educationfund.org
Website: IMPACT@educationfund.org

Table of Contents

Goals / Objectives

SC.7.N.1.4 Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.

SC.7.P.11.2 Investigate and describe the transformation of energy from one form to another.

SC.7.P.11.3 Cite evidence to explain that energy cannot be created nor destroyed, only changed from one form to another.

SC.8.N.1.4 Explain how hypothesis area valuable if they lead to further investigations, even if they turn out not to be supported by the data

SC.912.P.10.1 Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

S.C.912.P.12.2 Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time

Interactive Resources

Renewable and non-renewable energy - University Of …
www.childrensuniversity.manchester.ac.uk/.../science/energy/renewabl

Exploring Solar Energy Student Guide (7 Activities)
www1.eere.energy.gov/.../pdfs/solar_exploringsolarenergystudent.pdf

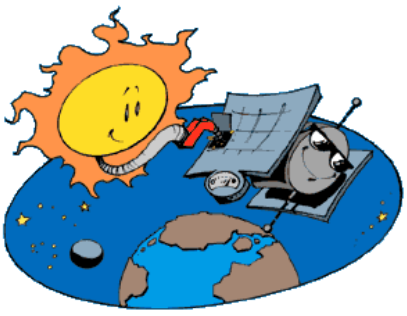
Renewable Energy Activities – Choices for …
www.nrel.gov/docs/gen/fy01/30927.pdf

NASA's Climate Kids :: Play Power Up!
climatekids.nasa.gov/power-u

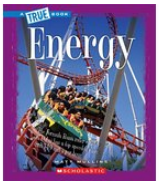
NOVA - Official Website | How Do Solar Panels Work?
www.pbs.org/wgbh/nova/tech/how-solar-cell-works.htm

Interactive Solar Maps | Find Solar
www.findsolar.com/Content/SolarMaps.aspx

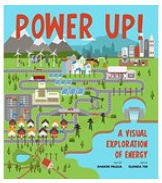
Inside a Solar Cell | Science | Interactive | PBS ...
www.pbslearningmedia.org/resource/ate10.sci.phys.energy.solarcell



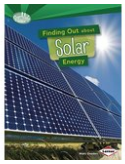
Literature Connections



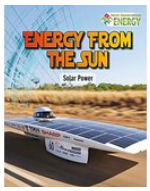
Energy (True Books: Physical Science (Paperback))
by Matt Mullins



Power Up!: A Visual Exploration of Energy
by Shaker Paleja and Ross Kinnaird



Finding Out About Solar Energy (Searchlight Books)
by Matt Doeden



Energy from the Sun: Solar Power (Next Generation Energy)
by James Bow

Running on Sunshine

Overview
In this design challenge, students will harness the power of the sun to design, construct and evaluate a solar-powered model car of their creation.

Content Objectives
Students will know that:

Solar energy is a renewable energy source, and its utilization has numerous benefits for our environment.

The angle at which a solar cell is positioned in relation to the sun affects its power output.

The amount of current produced by a photovoltaic cell is proportional to the amount of the light hitting the cell; therefore, increasing light intensity or increasing the size of the cell itself will increase the power output of the cell.

In order to construct a solar powered system that will work at maximum efficiency, numerous factors pertaining to the design, such as gear ratio and power output, must be considered.

Process Objectives
Students will be able to:

Describe three factors influencing a solar car's power needs: friction, air drag, and acceleration.

Calculate the gear ratio used in the drive system of their solar powered car. Describe the motion of their solar car based upon its position, direction, and speed.

Explain how the solar car design was optimized based upon gear ratio and materials used.

Utilize the design process to construct a solar-powered car.

Assessment Strategies

Evaluation of the completed student handouts and of the student's participation in class discussions.

Observation of student's participation throughout the process of designing a solar car.

Student participation in a team presentation of their solar-powered car design.
Completion of the student's solar car design evaluation.

Grade Level: 6-8

Suggested Time

Four to ten (4-10) 50-minute class periods.

Materials

Per Group:

Solar Sprint kit
Solar Sprint accessories kit
Various reused materials to construct a body for the car (foam core, Blue board, wood, corrugated cardboard)
Stopwatch
Solar Racing Student Handout

NOTE: *Instead of purchasing Solar Sprint kits, many accessories can be extracted from old toys, VCRs, tape recorders, old "Spirograph" gears and reused as shafts, wheels and gears.*

Running on Sunshine
(Solar Racing - Student Handout)

PART 1 (DESIGN YOUR OWN SOLAR-POWERED VEHICLE)

It is time for you to become an engineer. You have the knowledge to build your very own solar powered car! You and a partner(s) will be supplied with a motor, wheels, axles, and a solar cell. It is your job to design the car.

Talk with your partner and answer the following questions. What are some of the features you think your car should have to maximize the energy produced by the solar panel? What kind of materials should be used for the body? Record what you think in the box provided.

Brainstorming Session

What features should our car have? What materials should we use to make it?

Draw a diagram of your car's design below. Please use a separate page if you need more room. Think about strategic placement of the various necessary components in order to create the fastest car possible. Think about how you will go about securing the wheels and axles, as well as the motor and the solar cell.

Car Design #1:

Front View

Top View

Side View

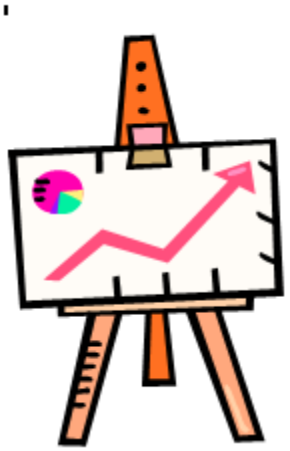
Analyzing your Data

1. Calculate the average start-to-finish time for each hourly time point.

2. Calculate the average speed, in meters per second, of your car at each hourly time point. Average speed is equal to the distance of the test track (in meters) divided by the average time (in seconds) it took the car to reach the finish line. For example, a 10 second time for a 40 meter distance would mean 40 meters /10 seconds or 4 meters per second.

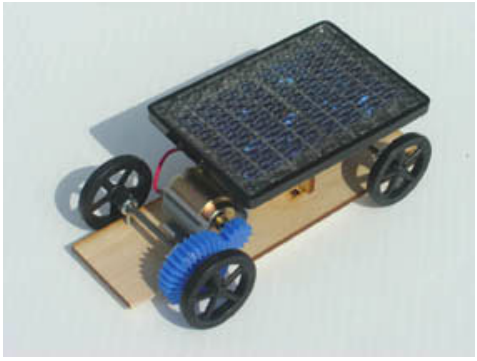
3. Make a table that shows the time of each race, the average speed of your solar car (in meters per second), and the angle of the sun at each time point.
    a. Did your car's speed change over time?
    b. When did you observe the top speed of your car? What was the angle of the sun at that time point?

4. Graph your data to show the average speed of your car (in meters per second, y-axis) vs. the angle of the sun with respect to the ground (in degrees, x-axis). Did your car's speed change as the angle of the sun increased?



Design and Build a Solar Car

1. Make sure your kit contains the items listed.
2. Locate the grid planning sheet in the kit.
3. Using a pencil and ruler, design the body of the vehicle and propulsion system. Remember, the lighter the vehicle's body, the further it will travel.
4. Show the drawing to the teacher when ready.
5. Locate the balsawood sheet from the kit
6. Transfer the vehicle body pattern to the balsawood.
7. Using the craft knife and straight-edge, carefully cut out the vehicle body.
8. Locate the straw from the kit. Also get scissors and glue gun.
9. Cut straw in half
10. Using the glue gun, attach the straws to the bottom of vehicle, one at each end (parallel to the end)
11. Locate the axles through each straw.
12. Push one wheel into each axle.
13. Insert and axle through each straw.
14. Carefully place the remaining wheel onto each axle.
    Note: This completes construction of the basic solar vehicle.
15. Locate the solar cell Panel and the required parts for the propulsion system chosen gears, pulleys, propeller, or rubber band. (Gears are supplied, Pulleys and propellers are optional.
16. Assemble and attach the propulsion system as designed.
17. Finish your solar racer as desired using paint, markers, etc.
18. Race the assembled vehicle on a flat surface in a sunny day.



NOTE: ***If there is no sunny location outside, you can test the solar powered car with a lamp having strong light (120 Watt) and reflector. Just place the solar car two feet under the strong light for sometimes. Now test the solar car and enjoy the ride.***

Energy Sources Research

Purpose

Although most of the energy consumed in the United States comes from fossil fuel sources, there are many other potential sources of energy available. In all cases, there are pros and cons to our use of these sources. Some of the energy sources are limited by their availability or environmental impact; others need technological improvements before they can become widely used. For scientists and engineers, research is the best way to learn about unknown topics.

This assignment calls you to examine information about energy sources and how those sources are used to produce electrical energy. You will begin to become an expert on one source of energy and report your findings back to the class. Then, you will meet with a group to discuss the various pros and cons that affect our use of different energy sources.

Procedures:

1. You will choose or be assigned a source of energy to research

2. Use the provided information to find the answers to the questions about your energy sources

3. After this portion of the assignment in completed you will be assigned to a group to fill in the energy sources chart.

4. Once you have filled in the chart, answer the two discussion questions.

Sources: Biomass, Fossil Fuels, Geothermal, Hydropower, Uranium, Solar, and /or Wind.

Research Questions

Energy Source: _____

1. What is your energy source? Where can it be found?

2. How do we obtain this energy? (How does it work?)

3. Are there different types or uses of this source? If yes, what are the differences?

4. What are the environmental impacts of your energy source?

5. What are the economic impacts of your energy source? How much does it cost per kWh?

6. What countries frequently use this source of energy? What percentage is it used in the United States?

7. What are the most common applications for this energy source? (at farms, in industry etc) Could this source be used in a family home?

Source Chart

While listening to the students in your group present their information, list some "pros" and "cons" of using that energy source to solve the energy problem.

Energy Source "pros" "cons"

Energy Source	Pro	Con
Biomass		
Fossil Fuels		
Geothermal		
Hydropower		
Uranium		
Solar		
Wind		

Discussion Questions:

1. If you had to choose an energy system to tell your community about based on the listed pros and cons, which system would you choose? Why?

2. Why do we as a nation depend so much on fossil fuels? What do you think we could do to reduce this dependence on fossil fuels?

Solar Car Rubric **Group Name:**_____ **Team Members:** _____**Section:**_____

Category	Unsatisfactory (0-1)	Satisfactory (2-3)	Outstanding (4-5)	Total
Body of car	0- Car body isn't cut out at all 1- Car body is cut poorly or and does not meet criteria	2- Car body meets criteria but is poorly cut. 3- Car body meets criteria and is cut but is very rough	4- Car body meets criteria cut is cut and somewhat rough. 5- Car body meets criteria and is cut well with smooth edges.	/5
Axles and wheels	0- Both sets of wheels, are not on body 1- Screw eyes are installed but axle and wheels are not.	2- At least one set of wheels are installed 3- Both sets of wheels are installed but are not aligned.	4- Both sets of wheels are installed and aligned but shakes 5- Both set of wheels are installed, aligned with little to no shaking	/5
Overall Performance	0- Car not fully constructed 1- Car is constructed but does not move.	2- Car moves but construction is poor 3- Car moves construction is satisfactory/car finishes race	4- Car moves and finishes race with minimal error 5- Car finishes race with no error.	/5
Google Sketch-Up	0- Design incomplete 1- Design is complete but does not meet all criteria	2- Design meets minimum criteria 3- Design meets at least half the criteria.	4- Design is complete with minimum error. 5- Design is complete with all criteria met.	/5
Participation	0- Showed no effort during project according to evaluation. 1- Showed little effort according to evaluation.	2- Showed some effort during project during evaluation. 3- Showed effort on and off throughout project.	4- Showed effort during project with little flaw according to evaluation. 5- Showed full effort during project	/5
Total-				/25

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APPLY FOR AN IMPACT II ADAPTER GRANT!

M-DCPS teachers, media specialists, counselors or assistant principals may request funds to implement an IMPACT II idea, teaching strategy or project from the Idea EXPO workshops and/or curriculum ideas profiled annually in the ***Ideas with IMPACT*** catalogs from 1990 to the current year, 2016-17. Most catalogs can be viewed at The Education Fund website at www.educationfund.org.

- Open to all K-12 M-DCPS teachers, counselors, media specialists
- Quick and easy reporting requirements
- Grants range from $150 - $400
- Grant recipients recognized at an Awards Reception

To apply, you must contact the teacher who developed the idea before submitting your application. Contact can be made by attending a workshop given by the disseminator, communicating via email or telephone, by visiting the disseminator in their classroom, or by having the disseminator visit your classroom.

Project funds are to be spent within the current school year or an extension may be requested. An expense report with receipts is required by Friday, May 5, 2017.

APPLICATION DEADLINE:
Monday, December 12, 2016

Apply online at www.educationfund.org

For more information, contact:
Edwina Lau, Program Director
305.558.4544, ext. 113
elau@educationfund.org

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