

SOLAR Car Races on a Budget

Activity category: workshop
Age range: Grades 5-8 or Grades 9-12
Time length: 1.5 hours to 2 hours

OBJECTIVE

To build a solar car that performs the best in the solar races, given limited resources.

DESCRIPTION

Students will work in pairs to first design, purchase the materials for, build, and finally race their solar cars using limited Solar Dollars and supplies. Economics and engineering combine in this activity to expose students to the engineering process, and the challenges that might be encountered along the way.

MATERIALS TO PURCHASE

Material	Purpose	Link	Cost
SunWind Solar SolRun Kit	Materials for the activity	https://sunwindsolar.com/solrun-classroom-15-pack/	CAD\$564
Lollipops or other prizes	Award winning teams		Depends.
Pencils and paper	Used for the design step – for children to draw out		
Hot glue guns	(optional) To glue components to the cars		
Duct tape	(optional) To stick components on to the cars		
Batteries	Backup in case it is raining or not sunny enough		
Demo car	Assembled car to introduce the activity and hand around during construction		

MATERIALS TO PRINT

- Solar car shop catalogue (one per team + one for the shop)
- Solar Hall of Fame (one per team)
- Solar Dollars (25 per team + 10 for shop)
- Labels for each of the materials (one per type of material)
 - You may want to write these up yourselves on small pieces of paper, with a thick marker. Printable labels are not provided in this package.



DETAILED STEPS

TIME	WHAT'S HAPPENING	Description
15 mins	<p>Introductions – our names & QSDT Car demo – call up two volunteers</p> <p>Brief intro to energy and how energy is lost. Challenge questions about percent of sun's energy retained in the car. Introduction to engineering problems and resources</p> <p>Components of the car? Explain each part briefly. Explain activity & solar awards</p>	<p>Discussion about energy, forms of energy, and how radiant/chemical energy is converted into mechanical energy to run the cars.</p>
15 mins	<p>Design. Groups of 2-3 campers. Hand out all starting materials to groups. Hand out papers and do design drawing + team names</p>	<p>Each team is encouraged to keep their budget in mind.</p>
30 mins	<p>Construction of cars. Solar shop opens!</p>	<p>Groups may be allowed to sell/trade among themselves as well.</p>
20 mins	<p>Car races!</p>	<p>Outside on a paved area.</p>
10 mins	<p>Announce prize category winners – have them come up and get lollipops. Debrief activity – what did you try out? What did you learn? Discuss that engineering is an iterative process.</p>	<p>Prizes: Lightning award Bulls-eye Most under budget Best car name Good-looking Design trailblazer</p>

ACTIVITY VISUALS

Photos of cars can be found here: <https://www.qsdt.net/post/sunwind-solar-our-solar-car-designs>

SAFETY

- Help children with poking holes in the wood pieces. Providing them with a thumbtack may help but should be done under supervision.

TIPS AND NOTES

Present the activity with excitement and stick to the solar shop rules to make the activity more engaging!



ADDITIONAL INFORMATION

SPECIFIC IDEAS FOR STEPS

- Walk around and provide individual support and advice:
 - Consider changing the gear ratio
 - Play around with the direction of the wheels
 - Covering up one portion of the solar panels prevents the entire car from moving, because the solar panels are in “series”
- Introduce challenges into the game:
 - You may now trade or sell your materials with any of the other teams (if you are operating on a “scarce resources” playing field).
 - The shop will no longer accept resales. You can ONLY trade or sell with the other teams.
 - The shop is charging a tax of 5 solar dollars from everyone who owns at least one gear.
- Prize categories:
 - Speedy
 - Bulls-eye
 - Most under budget
 - Best name
 - Good-looking
 - Design trailblazer
- In the debrief, discuss that the engineering process is iterative. Engineers must make mistakes and correct themselves, and that is how we learn!

CONTINGENCY PLANS

If it rains or isn't sunny enough, have batteries ready to race the cars indoors instead.

EXTRA LINKS AND RESOURCES

In the following pages you will find:

- Solar car shop catalogue – works best if you give one to each team for them to use during the design process, so they can mark what they plan to purchase.
- Solar Car Hall of Fame – inspiration solar cars for the students to use when building.
- Solar Dollars



SOLAR CAR SHOP CATALOGUE








Each team is provided:

1 SOLAR PANEL

1 BODY

1 MOTOR

1 MOTOR MOUNTING CLIP

Photo	Item Name	Cost	Resale Price
	Bushings	1	1/2
	Elastic Bands	1	1/2
	Dowels	2	1
	Screw Eyes	1	1/2
	Wood Blocks	2	1
	Gears	2	1
	Worm gears	1	1/2

	Propeller	2	1
	O ring Big	1	1/2
	O ring medium	1	1/2
	O ring small	1	1/2
	Straw	1	1/2
	Crown gears	1	1/2
	Small Wheels/pulleys	1	1/2
	Medium Wheels/pulleys	2	1
	Big wheels/pulleys	2	1

Solar Car Hall of Fame

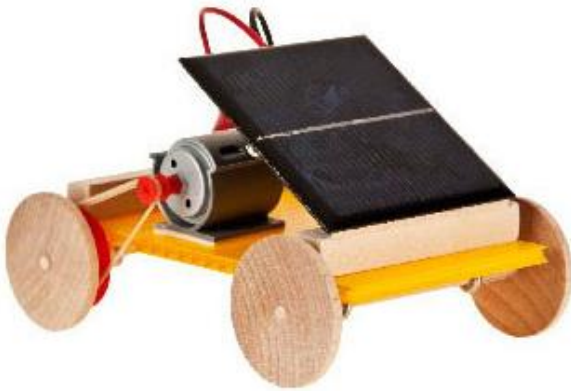
Direct drive car - "steady Freddy"



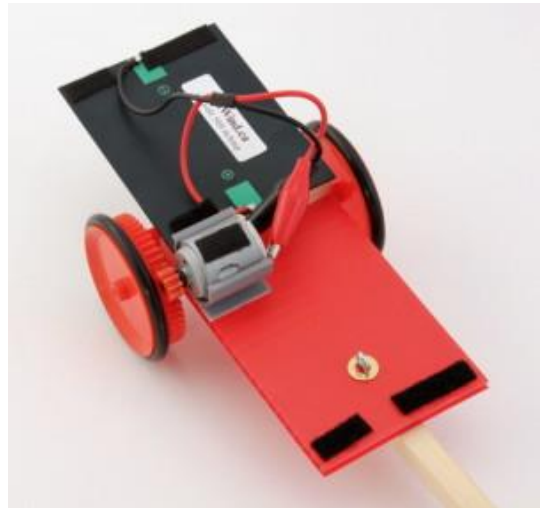
Wind energy car - "number one fan"



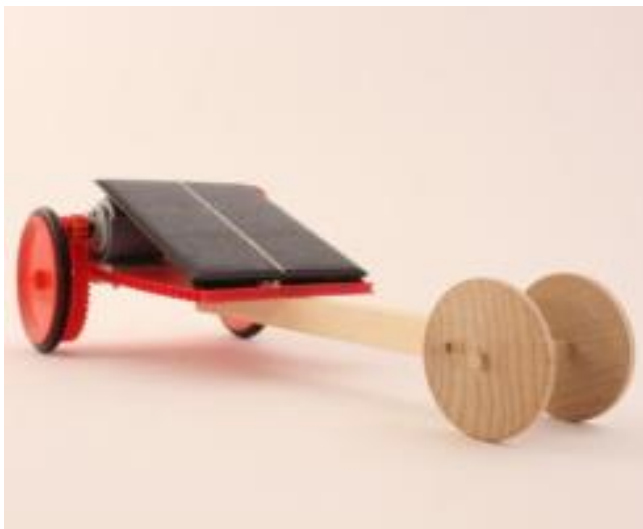
Pulley technology - "pull me along"



Gear technology - "gear me up"



Wheel modifications V1 "The dragster"



Wheel modifications V2 "The tall man"





