Grade 4

Solar Car Project- initial build April 8th

This lesson utilizes the engineering design activity of building a solar car to help students learn these concepts. The students are encouraged to think about each component of a solar car and how these parts fit and work together. They then translate these thoughts into a design for the car that utilizes the materials available to them. Finally, they use their design to engineer an actual solar car.

Key Terms:

*Current*: Movement of electrons

*Voltage*: Designates "electric pressure" that exists between two points and is capable of producing a flow of current when a closed circuit is connected between the two points. (This can also be considered with the analogy of elevation; just as a hill will have water flow down it, a voltage will have current flow in the direction from high to low.)

*Photovoltaic Cell*: This is a semiconductor device that converts the energy of sunlight into electric energy.

*Transduce*: To convert into another form

*Conductor*: This is a material that allows electricity to move through it easily. That is, it is a material with low electrical resistance, one in which a fairly small voltage will produce a fairly large current.

*Chassis*: This is the frame that holds the body and motor of an automobile together.

*Axle*: This is the supporting shaft on which a set of wheels revolves.

**Materials:**

**You can build your own or for this year you may use a premade kit- you may only use 1 solar cell.**

* 1 solar cell {2.0V/200mA} (can be purchased online)
* Rubber bands
* Small, inexpensive low voltage dc motor (can be purchased online or at a hobby shop)
* For car body (chassis): Sturdy cardboard (i.e. juice carton, cereal box), balsa wood, water bottle or similar materials
* For wheels: Plastic bottle caps, toy wheels, etc.
* For axles: Wooden skewers
* Straws to mount the axles
* Rubber or foam beads
* Piece of eraser, clay, etc.
* Tape
* Hot glue gun
* Wooden block, folded cardboard, etc. to prop up motor
* Scissors or utility knives
* Ruler and protractor

**Building the Solar Car (**

**Video-** [**http://www.teacherstryscience.org/lp/racing-sun-creating-solar-car**](http://www.teacherstryscience.org/lp/racing-sun-creating-solar-car)

Once they have really thought about the design of their car, they are ready to begin building.  Students could construct their cars in the order below, but remember, this is just one way to create a car.

1. If the wheels do not already have a hole in them, use a knife or nail to poke a hole in the center of all four wheels. The holes should be small enough that the wooden skewer axles fit snugly.
2. Take the juice carton that you will use for your chassis (car body) and cut it in half the long way. You will only use one half of the carton so discard the second half.
3. Cut a rectangular hole in the chassis that is large enough to fit the rubber bead and allow the bead to rotate. It should be no larger than 3.25 cm long and 2.5 cm wide.
4. Attach the axles onto your chassis. For the back axle, tape or glue a straw to the underside of the chassis and put the wooden skewer through the straw. For the front axle, cut a straw in half. Place the halves so that they are lined up with the rectangular hole you cut in step 3 and tape one half to either side of the hole. Put the wooden skewer through one straw and then place the foam bead on the skewer so that it fits snugly into the rectangular hole. Put a rubber band around the bead and then put the skewer through the other straw.
5. You will now place a wooden block, piece of folded cardboard, or something similar along the long side of the rectangular hole to prop the motor up. The motor should be far enough from the axle that the rubber band is just taut when attached to the motor. After you have placed the block and confirmed that the band will be taut, glue the block in place. Once the glue has dried, position the motor on top of the block. The tip of the motor should be facing the hole.  Once you have positioned the motor, glue it in place.
6. Attach the rubber band to the tip motor and place a piece of clay, glue, or eraser to keep the rubber band from slipping off. The band should still be able to move freely.
7. Place the wheels on the axles you have created. If the holes are too large, you can use glue to seal the holes. Wind rubber bands around the front wheels to act as tires.
8. Attach the solar panel to the motor using the wires attached to the panel. If you wish, you can place tape on the wires to secure the connection between panel and motor. You can prop the panel up to change the angle using another block or folded cardboard.
9. Once you have created your car, you can begin testing. Place the car outside in the sun or under a bright light. Make changes to your design as needed.
10. Create a Display Board- using the Engineering Design Model documenting your design, problems- solutions, trials, redesigns and a typed conclusion of what you learned and what you would try or do differently.