There’s More to Juice than Meets the Eye

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Connections to the Next Generation Science Standards

Practice Elements:

Crosscutting Concept Elements:
♦ Energy cannot be created or destroyed, it only moves between one place and another place between objects and/or fields, or between systems.
♦ Models can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales.

Disciplinary Core Idea:
HS-PS4-5. Solar cells are human-made device that likewise capture the Sun’s energy and produce electrical energy.

Component Idea:

Lesson Summary

What makes solar energy a viable source of power?

Students are introduced to the different concepts in chemistry behind the processing of a solar cell device. They will learn the needed knowledge and skills as the school year progresses and finally develop a solar cell device made from household materials. They will create a solar cell device of different film from different juices and test it in varied light intensity. Once the results are analyzed, the students will recognize pattern and realize that the different structure/morphology of the film affects photovoltaic cell’s performance.

Some of the enormous benefits why solar energy is a viable source of energy are: it is renewable, reliable, minimal environmental impact, does not emit greenhouse gases, no transport cost, and can be cheaply mass produced.

To make the partnership sustainable and to ensure efficiency and effectiveness of the program, a calendar of activities based on the curriculum is made and discussed with the partner to identify individual responsibilities and resources needed. The concepts and processes behind the making of a solar cell will be introduced when valence electron is discussed and inject the processes involved in each appropriate topic, such as: chemical bonding, catalyst, rate of reaction, stoichiometry, law of conservation of energy, etc. Different methods of instructions from teleconferencing, video presentation, simulation, to hand-on activities will be utilized to optimize transfer of knowledge.

Target Grade Level: 9-12

Learning Performance:
To create, test, and analyze different solar cell devices made out of different juices that would prove conversion of solar energy to electrical energy and identify patterns that connects film morphology to device performance.
The Law of Conservation of Energy

The class will discuss and define “energy” as the ability to do work. Review with class that “work” is done when something moves or changes. Potential energy is stored energy or the energy an object contains. Kinetic energy is energy in motion or doing work. There are different forms of energy which include (but are not limited to) heat, mechanical and electrical energy. Fuels or energy resources are needed to produce energy.

Introduce the fuels or resources needed to produce energy. Relate how our bodies use food as fuel to help us function or give us energy. As a class, list types of energy resources or fuels used to produce energy: coal, petroleum, natural gas, wind, water, solar, wood, etc. Introduce the sun as our primary energy source. Discuss the sun’s heat and light energy as being essential for life on earth. (Plants need sunlight to make food through the process of photosynthesis, and animals eat plants. Heat energy is needed by plants and animals for survival.)

Display sun model and a clear cup of oil. Ask students which energy resource can be used up. Discuss the term, “renewable.” Have volunteers explain the difference between renewable and nonrenewable resources.

In addition to supplying plants and animals with heat and light, list simple examples of solar heat energy doing work such as wet clothes drying outside, pool water being heated, puddles drying up etc.

Introduce to the class the principle behind solar cells. Also known as Photovoltaic (PV) cells convert sunlight directly into electricity. Semiconductor materials absorb sunlight energy and create an unbalanced flow of electrons from one side of the solar cell to the other. The sides are connected with a metal material which allows the electrons to travel. The flow of electrons produces electricity. Solar cells are often used in small devises such as calculators. Numerous photovoltaic cells can be interconnected to produce more power.

Additional Unit Plan Information: http://bit.ly/2a4TeCF

Science Partners

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