

Poster Contest

Student Objectives

The student:

- will identify major events in the history of solar energy
- will work cooperatively to create a poster that communicates information.

Materials:

- posterboard or large sheets of paper
- various art materials, e.g. paints, markers, crayons and computer graphics
- time line information
- internet connection and research books (optional)

Key Words:

passive solar
photovoltaic
solar collector
solar furnace
solar still
time line

Time:

1 class period

Background Information

See Solar Energy Time Line

Procedure

1. Divide the class into groups of three or four students per group.
2. Explain to the class that they will be creating posters to depict a part of the time line of solar history, and then sharing them with the class.
3. Assign a period of history to each group. Groups divisions could be:
 - prior to 1600
 - 1600 - 1800
 - 1800s
 - 1900 - 1953
 - 1954 - 2000
 - 2000 to present
4. Tell the class they don't have to illustrate everything in their part of the time line, rather they should pick one or two things that interest them or that they think are particularly important for their posters.
5. Assist the groups as necessary while they are working on their posters. For younger students, you may need to help them read and/or understand their assigned section of the time line.

6. When the posters are completed, have each group present their poster to the class and explain what information they are depicting.
7. Have the class vote on which time period in solar energy history they think is the most interesting and important. Encourage debate.
8. Hang the posters in the class for the duration of your work on Solar Matters. After the unit is completed, the posters could be hung in a common area or hallway of the school.

Key Words & Definitions

- **passive solar** – construction technique that uses structural elements to bring in heat when needed and deflect or vent heat when it is not desired
- **photovoltaic** – the effect of producing electric current using light from the Sun
- **solar collector** – a device that collects solar energy
- **solar furnace** – a device that uses solar energy to heat, burn or melt
- **solar still** – a device that uses solar energy to distill a liquid
- **time line** – a chronological list of historical events that all relate to a specific subject

Further Research

1. Have students create posters with their ideas of how solar energy will be used in the future.

Related Reading

- ***Solar Power (Tales of Invention)*** by Chris Oxlade (Heinemann, 2011)
Students will learn the history of the development of solar power including information on inventors, the setbacks along the way, and the moments of discovery. Includes a solar energy time line and historical connections.
- ***The Kid's Solar Energy Book*** by Tilly Spetgang (Imagine, 2009)
Cleverly intertwined with the science of solar thermal and photovoltaics are economic lessons about the cost advantages of energy efficient buildings and the history of solar energy. Illustrated with cartoon figures and set in a classroom, this book is appealing to students.

Internet Sites

http://www.eere.energy.gov/solar/pdfs/solar_timeline.pdf

Department of Energy, Energy Efficiency and Renewable Energy's illustrated solar energy time line.

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B.C.E.

- 4.5 billion years ago Solar energy reaches the earth.
- 7th Century B.C.E. Magnifying glass used to concentrate the Sun's rays to make fire.
- 3rd Century B.C.E. Greeks and Romans use "burning mirrors" to focus sunlight as a weapon of war to ignite fires and burn sails of enemy war ships.

Year 1 - 500

- 20 A.D Chinese use sunlight and mirrors to light torches for religious purposes.
- 100 Italian historian, Pliny the Younger, builds a passive solar home, using glass for the first time to keep heat in and cold out.
Roman baths are built with large windows facing the south that let sunlight in for heat.

500s

In Rome a law is enacted to protect sunrooms on houses and public buildings so that shadows will not interfere with the light and heat from the Sun.

1300s

Ancestors of the Pueblo people (Anasazi), in North America live in south-facing cliff dwellings that capture the warmth from the winter sun.

1600s

- 1643-1715 Educated people accept the idea that our Sun and the stars are the same type of heavenly body.
The reign of French King Louis XIV, ("Sun King"), is an era of solar experiments.
- 1695 In France, Georges Buffon concentrates sunlight using mirrors to ignite wood and melt lead.

1700s

- Wealthy Europeans use walls to store solar heat for ripening fruit (fruit walls).
England and Holland lead in the development of greenhouses with sloping glass walls facing south.
Frenchman Antoine Lavoisier builds a solar furnace to melt platinum.
- 1767 Swiss scientist Horace de Saussure invents the first solar collector (solar hot box).

1800s

- Wealthy Europeans build and use solar-heated greenhouses and conservatories.
French scientists use heat from a solar collector to make steam to power a steam engine.
- 1830s Astronomer Sir John Herschel uses a solar cooker to cook food for his expedition to South Africa.
- 1860s In the U.S., pioneers find that water left in black pans in the sunlight gets hot.
- 1861 French scientist Augustin Mouchot patents a solar engine.
- 1870s Augustin Mouchot uses solar cookers, solar water pumps for irrigation, and solar stills for wine and water distillation. This is the most uses of solar energy in one place.
- 1880s Engineer John Ericsson, develops solar-driven engines for ships.
A solar-powered printing press is working in France.
- 1891 Baltimore inventor Clarence Kemp, patents the first commercial solar water heater in the U.S.
- 1892 Inventor Aubrey Eneas founds Solar Motor Company of Boston to build solar-powered motors to replace steam engines which are powered by coal or wood.
- 1897 Kemp's water heaters are being used in 30% of homes in Pasadena, CA.

1900s

- 1908 In Los Angeles, Carnegie Steel Company invents the modern type of roof solar collector for heating water.
- 1920s Albert Einstein receives the Nobel Prize for his work on the

- photoelectric effect.
- 1936 American astrophysicist Charles Greeley Abbott invents the solar boiler.
- 1940s Great demand for solar homes, both active and passive, inspires the printing of *Your Solar House*, a book of house plans by 49 solar architects.
- 1941 Approximately 60,000 solar water heaters are in use in Florida.
- 1950s Architect Frank Bridgers designs the world's first solar-heated office building.
- 1954 Bell Labs produces photovoltaic cells that reach 10% efficiency. This is considered the “birth” of photovoltaics.
- Late 1950s Solar cells are used extensively in the space industry for satellites.
- 1970s The Department of Energy is established, and the national solar research labs are also established.
- 1973 Energy shortages and the oil embargo causes public interest in solar energy to increase.
- 1974 The Florida Solar Energy Center (FSEC), largest state solar center, is opened.
- 1977 President Jimmy Carter installs solar panels on the White House and promotes incentives for solar energy systems.
- 1980s U.S. government and private industry assist several thousand Navaho and Hopi Indians in Arizona and New Mexico supplement their passive solar homes with photovoltaic power.
- 1983 Wisconsin enacts solar access law to protect the "right to light" for urban gardens. Arizona and Michigan follow with similar laws.
- 1990s Tokyo has approximately 1.5 million buildings with solar water heaters (more than in the entire U.S.); Israel uses solar water heating for approximately 30 percent of their buildings and all new homes are required to install solar water heating systems; Greece, Australia and several additional countries are ahead of the U.S. in solar energy usage.

2000s

- 2000 On the International Space Station, astronauts install photovoltaic panels on what is the largest solar power array in space. Each wing of the array consists of 32,800 solar cells.

- 2001 NASA's solar-powered aircraft, Helios, sets a new world record for non-rocket powered aircraft: 96,863 feet (more than 18 miles high).
- 2002 NASA successfully conducts two tests of a solar-powered, remote-controlled aircraft called Pathfinder.
- 2003 A solar thermal system is installed to heat the swimming pool at the White House.
- 2008 Photovoltaic cells exceed 40% efficiency in the laboratory.
- 2013 President Obama installs photovoltaic panels and a solar thermal collector on the White House roof (the solar panels that were installed by President Carter were removed by President Reagan).
- 2014 A 392 megawatt concentrated solar powered electric generation plant goes online in California.

Poster Contest

Florida NGSS Standards & Related Subject Common Core

			.1	.2	.3	.4	.5	.6	.7	.8
Grade 3										
Earth in Space and Time	Big Idea 5	SC.3.E.5		X						
Earth Structures	Big Idea 6	SC.3.E.6	X							
Forms of Energy	Big Idea 10	SC.3.P.10	X							
Grade 4										
Earth in Space and Time	Big Idea 5	SC.4.E.5			X					
Earth Structures	Big Idea 6	SC.4.E.6			X					
Forms of Energy	Big Idea 10	SC.4.P.10	X							
Grade 5										
Forms of Energy	Big Idea 10	SC.5.P.10	X							
Visual Arts Standards	Third Grade: VA.3.F.3.1, VA.3.F.3.2 Fourth Grade: VA.4.F.3.1, VA.4.F.3.2 Fifth Grade: VA.5.F.3.1, VA.5.F.3.3									

Third Grade Benchmarks

Science–Big Idea 5: Earth in Space and Time

- SC.3.E.5.2 - Identify the Sun as a star that emits energy; some of it in the form of light.

Science–Big Idea 6: Earth Structures

- SC.3.E.6.1 - Demonstrate that radiant energy from the Sun can heat objects and when the Sun is not present, heat may be lost.

Science–Big Idea 10: Forms of Energy

- SC.3.P.10.1 - Identify some basic forms of energy such as light, heat, sound, electrical, and mechanical.

Visual Arts–Innovation, Technology, and the Future

- VA.3.F.3.1 - Create artwork that communicates an awareness of events within the community.
- VA.3.F.3.2 - Collaborate to complete a task in art.

Fourth Grade Benchmarks

Science–Big Idea 5: Earth in Space and Time

- SC.4.E.5.3 - Recognize that the Earth revolves around the Sun in a year and rotates on its

axis in a 24-hour day.

Science--Big Idea 6: Earth Structures

- SC.4.E.6.3 - Recognize that humans need resources found on Earth and that these are either renewable or nonrenewable.

Science--Big Idea 10: Forms of Energy

- SC.4.P.10.1 - Observe and describe some basic forms of energy, including light, heat, sound, electrical, and the energy of motion.

Visual Arts--Innovation, Technology, and the Future

- VA.4.F.3.1 - Create art to promote awareness of school and/or community concerns.
- VA.4.F.3.2 - Collaborate with peers in the art room to achieve a common art goal.

Fifth Grade Benchmarks

Science--Big Idea 10: Forms of Energy

- SC.5.P.10.1 - Investigate and describe some basic forms of energy, including light, heat, sound, electrical, chemical, and mechanical.

Visual Arts--Innovation, Technology, and the Future

- VA.5.F.3.1 - Create artwork to promote public awareness of community and/or global concerns.
- VA.5.F.3.3 - Work collaboratively with others to complete a task in art and show leadership skills.

National Next Generation Science and Common Core Visual Arts Standards

Third Grade Standards

Visual Arts--Connecting

- Cm10.1.3a - Develop a work of art based on observations of surroundings.

Fourth Grade Standards

Visual Arts--Creating

- Cr1.1.4a - Brainstorm multiple approaches to a creative art or design problem.
- Cr1.2.4a - Collaboratively set goals and create artwork that is meaningful and has purpose to the makers.