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.

Key Words:
passive solar
photovoltaic
solar collector
solar furnace
solar still
time line

Materials:
- posterboard or large sheets of paper
- various art materials (e.g. paints, markers, crayons and computer graphics)
- time line information

Time:
1 – 2 class periods

Procedure
1. Divide the class into groups of three or four students.
2. Explain to the class that they will be creating a poster 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. Group divisions could be:
   - prior to 1600
   - 1600 - 1800
   - 1800s
   - 1900 - 1953
   - 1954 - 2000
   - 2000 - present
4. Tell the class they don't have to illustrate everything in their part of the time line, rather they should pick a few things for their poster that interest them or that they think are particularly important.
5. Assist the groups as necessary while they are working on their posters.
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.
8. Hang the posters in the class for the duration of your work on Solar Matters.

Key Words & Definitions

- **passive solar** – construction technique of using 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

Related Research

1. What are the future trends in solar energy? Research what the experts think will be the trends in solar energy in the future.
2. Research important scientists in the history of solar energy.
   - The mean daily solar radiation is measured in Langleys, named for Samuel Langley. What did he do to earn this honor?
   - The reign of Louis XIV of France (1643-1715) was an era of solar experiments. Louis gained the title of Sun-King. Why?
   - Tales tell us that Archimedes saved the Greek city of Syracuse from Marcellus and his Roman fleet by using reflectors to concentrate solar energy on invading ships, which caused them to catch fire and burn. Is there any credibility to these stories? Watch the *Mythbusters* episode that explored this story.
   - Georges Buffon proved the potential of concentrating solar energy in 1695. What did he do?
   - Antoine Lavoisier built a solar furnace with curved glass sections filled with wine. What did he do with this solar furnace? How are solar furnaces used today?
3. Have the students produce skits about their time period.
4. Prepare a presentation to give to parents, a partner class, or the school in general for Earth Day on the history and current applications of solar energy.

Internet Sites

http://www1.eere.energy.gov/solar/pdfs/solar_timeline.pdf
U.S. Department of Energy solar time line

http://www.eia.gov/kids/energy.cfm?page=tl_solarthermal
U.S. Energy Information Administration, Solar Thermal Energy Time Line for students

http://www.eia.gov/kids/energy.cfm?page=tl_photovoltaic
U.S. Energy Information Administration, Photovoltaic Time Line for students

Poster Contest

Florida NGSS Standards & Related Subject Common Core

			.1	.2	.3	.4	.5	.6	.7	.8	.9	.10	.11	.12
Grade 6														
Practice of Science	**# 1**	**SC.6.N.1**					**X**							
Characteristics of Scientific Knowledge	**# 2**	**SC.6.N.2**		**X**	**X**									
Grade 8														
Science & Society	**# 4**	**SC.8.N.4**	**X**	**X**										
Social Studies Standards	**Sixth Grade -** SS.6.W.1.1 **Eighth Grade -** SS.8.A.1.2													
Language Arts Standards	**Sixth Grade -** LAFS.6.SL.2.4, LAFS.6.SL.2.5 **Seventh Grade -** LAFS.7.SL.2.4, LAFS.7.SL.2.5 **Eighth Grade -** LAFS.8.SL.2.4, LAFS.8.SL.2.5													
Visual Arts Standards	**Sixth to Eighth Grade:** VA.68.F.3.1, VA.68.F.3.3													

Sixth Grade Benchmarks

Science–Big Idea 1: The Practice of Science

- SC.6.N.1.5 - Recognize that science involves creativity, not just in designing experiments, but also in creating explanations that fit evidence.

Science–Big Idea 2: The Characteristics of Scientific Knowledge

- SC.6.N.2.2 - Explain that scientific knowledge is durable because it si open to change as new evidence or interpretations are encountered.
- SC.6.N.2.3 - Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals.

Social Studies–World History

- SS.6.W.1.1 - Use timelines to identify chronological order of historical events.

Language Arts–Standards for Speaking and Listening

- LAFS.6.SL.2.4 - Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.
- LAFS.6.SL.2.5 - Include multimedia components and visual displays in presentations to clarify information.

Visual Arts–Innovation, Technology, and the Future

- VA.68.F.3.1 - Use technology applications through the art-making process to express community or global concerns.
- VA.68.F.3.3 - Collaborate with peers to complete an art task and develop leadership skills.

Seventh Grade Benchmarks

Language Arts–Standards for Speaking and Listening

- LAFS.7.SL.2.4 - Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.
- LAFS.7.SL.2.5 - Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.

Visual Arts–Innovation, Technology, and the Future

- VA.68.F.3.1 - Use technology applications through the art-making process to express community or global concerns.
- VA.68.F.3.3 - Collaborate with peers to complete an art task and develop leadership skills.

Eighth Grade Benchmarks

Science–Big Idea 4: Science and Society

- SC.8.N.4.1 - Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels.
- SC.8.N.4.2 - Explain how political, social, and economic concerns can affect science, and vice versa.

Social Studies–American History

- SS.8.A.1.2 - Analyze charts, graphs, maps, photographs and timelines; analyze political cartoons; determine cause and effect.

Language Arts–Standards for Speaking and Listening

- LAFS.8.SL.2.4 - Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.
- LAFS.8.SL.2.5 - Integrate multimedia and visual displays into presentation to clarify information, strengthen claims and evidence, and add interest.

Visual Arts–Innovation, Technology, and the Future

- VA.68.F.3.1 - Use technology applications through the art-making process to express community or global concerns.
- VA.68.F.3.3 - Collaborate with peers to complete an art task and develop leadership skills.

National Next Generation Visual Arts Standards

Sixth Grade Standards

- Cr.1.1.6a - Combine concepts collaboratively to generate innovative ideas for creating art.

Note: Related Common Core Language Arts Standards are listed in the Florida section above.

Seventh Grade Standards

- Cr.2.3.7a - Apply visual orgaizational strategies to design and produce a work of art,

design, or media that clearly communicates information or ideas.

Note: Related Common Core Language Arts Standards are listed in the Florida section above.

Eighth Grade Standards

- Cr2.3.8a - Select, organize, and design images and words to make visually clear and compelling presentations.

Note: Related Common Core Language Arts Standards are listed in the Florida section above.

Poster Contest - Solar History Time Line

B.C.E.

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

Year 1 - 500 A.D.

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

600s

Justinian Code enacted to protect sunrooms on houses and public buildings so that shadows will not interfere with the sun used for heat and light.

1300s

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

1600s

Educated people accept the idea that the sun and stars are the same.

1643-1715	Reign of French King Louis XIV, ("Sun King"), is an era of solar experiments.
1695	French Georges Buffon concentrates sunlight using mirrors to ignite wood and melt lead.

1700s

European aristocracy use walls to store solar heat for ripening fruit (fruit walls).
England and Holland lead development of greenhouses with sloping glass walls facing South.
Frenchman Antoine Lavoisier builds solar furnace to melt platinum.

1767	Swiss scientist Horace de Saussure invents first solar collector (solar hot box).

1800s

Wealthy Europeans build and use solar-heated greenhouses and conservatories.
French scientist uses heat from solar collector to make steam to power a steam engine.

1830s	Astronomer Sir John Herschel uses solar cooker to cook food for his expedition to South Africa.
1839	French scientist Edmund Becquerel observes photovoltaic effect.
1860s	Post Civil War U.S. development of solar energy; pioneers find that water left in black pans in the sunlight gets hot.
1861	French scientist Augustin Mouchot patents solar engine.
1870s	Augustin Mouchot uses solar cookers, solar water pumps for irrigation, and solar

	stills for wine and water distillation (most widespread use of solar energy).
1880s	Engineer John Ericsson, "first American Solar Scientist," develops solar-driven engines for ships.
	Solar-powered printing press working in France.
1891	Baltimore inventor Clarence Kemp, ("real father of solar energy in the U.S."), patents first commercial Climax Solar Water Heater.
1892	Inventor Aubrey Eneas founds Solar Motor Company of Boston to build solar-powered motors to replace steam engines powered by coal or wood.
1897	Kemp's water heaters used in 30% of homes in Pasadena, CA.
	1900s
1905	Albert Einstein publishes a paper explaining the photoelectric effect on a quantum basis.
1908	Los Angeles: Carnegie Steel Company invents modern type of roof solar collector.
1920s	Solar Industry focus moves from California to Florida.
1936	American astrophysicist Charles Greeley Abbott invents solar boiler.
1940s	Great demand for solar homes, both active and passive, creates Your Solar House, a book of house plans by 49 great solar architects.
1941	Approximately 60,000 solar water heaters in use in Florida.
1950s	Architect Frank Bridgers designs world's first solar-heated office building.
	Low-cost natural gas becomes primary heating fuel.
1954	Photovoltaics reach 10% efficiency; becomes the “birth” of photovoltaics.
Late 1950s	Extensive use of solar cells in space industry for satellites.
1960s	Some U.S. solar companies manufacturing solar cells or solar hot water heaters; U.S. oil imports surpass 50 percent.
1967	Soyuz 1 is the first manned spacecraft to be powered by photovoltaics.
1968	First solar powered wristwatch is sold.
1970s	Department of Energy established; national solar research labs established.
1973	Energy shortages/oil embargo; indifference about solar energy begins to decline.
1974	Florida Solar Energy Center (FSEC), largest state solar center, is established.
	The world’s first (modern day) building (in New Mexico), heated and powered only by solar and wind power.
1977	President Jimmy Carter installs solar panels on the White House and promotes incentives for solar energy systems.
1978	First solar powered calculators.
1979	Second U.S. oil embargo; Solar trade association (Solar Energy Industries Association) established in Washington, DC.
1980	Energy Security Act virtually shuts down national solar research programs; states begin establishing solar research facilities.
	Thin film photovoltaic cells exceed 10% efficiency and become a usable form of photovoltaics.
1980s	U.S. government and private industry assist several thousand Navajo 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,

	soon enacted in Arizona and Michigan.
1986	President Reagan removes the solar panels from the White House.
1989	Reflective solar concentrators are first used with solar cells.
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	Astronauts begin installing solar panels at the International Space Station. Each wing of the array consists of 32,800 solar cells.
2001	NASAs solar-powered airplane, Helios, sets a world altitude record for non-rocket powered craft at 96,863 feet.
2003	9kW photovoltaic system and a solar thermal system were installed to heat the swimming pool at the White House.
2008	Photovolatic cells exceed 40% efficiency in the laboratory.
2013	President Obama installs photovoltaic panels and solar thermal collector on White House roof.
2014	Ivanpah, a 392 megawatt concentrated solar powered generation plant goes online in California.