

Introduction to Engineering Gateway to Technology

Solar Community Building Design

Subject Area: Technology Grade Levels: 8th

Date: 11/22/2010 rev. 1

Lesson Overview

Students will use their knowledge of solar energy technology and energy conservation in the creation of new building construction design. The goal of student teams is to design and building a model building which utilizes passive thermal and photovoltaic energy and create a powerpoint presentation discussing solar energy in general and their particular building design features.

Materials Included in this Lesson

- Teaching Solar; Rarus Institute Classroom Curriculum and Activities
- Your Solar Home; Rarus Institute Student guide Book
- Schuco Solar Solutions Video/Notes (Beutler Air Corporation)
- Powerpoint Presentation; Basics of Solar Including the Vintage Oaks SMUD/Beutler Air Corp Solar Community

Other Materials for this Lesson

- Home framing kit and tools (Kelvin)
- Photovoltaic cells (Pitsco)
- Internet
- Graphing paper/Notebook
- Computer
- Presentation software
- Building Materials (student gathered)
- Digital Camera

Skills the Student will Learn

Students will be able to compare and contrast the pros and cons of solar energy.

Students will be able to discuss passive thermal energy and photovoltaic cells and how and why they are used in building design.

Students will be able to discuss the orientation and angle of the solar as it relates to the orientation of their building's features in order to maximize solar energy efficiency.

Student groups will design and build a model home displaying their chosen energy conservation/green technology features.

Student Deliverables

Teaching Solar Worksheets
Cornell notes on lecture and videos
Blue prints of building design
Powerpoint presentation

Model of Solar Building Design

A power point presentation powerpoint presentation discussing solar energy in general and their particular building design features.

Formal Assessments presentation rubric, and home design specification rubric.

Length of Lesson: 25 Days

Activity Day One

Introduction to Energy Home Project
Facing the Sun
Activity- Sun Angle Quadrant

Activity Day Two

The Reasons for the seasons – Charting the Sun's path
Activity – Solar Azimuth Finder

Activity Day , Three, Four, Five

Custom Solar Home Model Handout and graph paper

Activity Day Six

Schuco Solar Solutions Video
Renewable energy Guide for Buildings Handout and Worksheet

Activity Day Seven and Eight

Solar energy and Solar home research – Internet textbooks

Activity Day Nine

Basics of Solar powerpoint presentation
Energy Conservation in the home Handout and worksheet

Activity Day Ten

Schuco Solar Solutions Video

Passive Solar Design for homes Handout and worksheet

Activity Day Eleven

Rahus Institute Solar Decathlon Video
Group work on Solar Building Design

Activity Day Twelve – Twenty Two

Group Work on Solar Building Design

Activity Day Twenty Three – Twenty Four

Group Presentations

Enrichment Suggestions

Have students create a home energy conservation brochure to share with the community.

Student Resources

Write any additional student resources here such as online resources, library and worksheets.

Teacher Resources

Rahus Institute –Solar Schoolhouse Publications and Curriculum

Buetler Air Corporation Materials

Schuco Solar Solutions DVD – Buetler Air Corporation

Kidwind.org – Basics of Solar powerpoint presentation

Infinitepower.org – The Infinite Power of Texas Renewable Energy Lessons

State Standards Met

CTE Standard: 10.0 Technical Knowledge and Skills

Students understand the essential knowledge and skills common to all pathways in the Energy and Utilities sector:

- 10.2 Know the common energy and power technologies.
- 10.3 Know the sources and systems of power and energy.
- 10.4 Know the energy resources currently in use or under research

CTE Standard: 2.0 Communications

Students understand the principles of effective oral, written, and multimedia communication in a variety of formats and contexts.

(The standards listed below retain in parentheses the numbering as specified in the English– language arts content standards adopted by the State Board of Education.)

- 2.4 Deliver multimedia presentations: a. Combine text, images, and sound by incorporating information from a wide range of media, including films, newspapers, magazines, CD-ROMs, online information, television, videos, and electronic media-generated images. b. Select an appropriate medium for each element of the presentation. c. Use the selected media skillfully, editing appropriately and monitoring for quality. d. Test the audience’s response and revise the presentation accordingly.

California Science Standards: Periodic Table

7. The organization of the periodic table is based on the properties of the elements and reflects the structure of atoms. As a basis for understanding this concept:

c. Students know substances can be classified by their properties, including their melting temperature, density, hardness, and thermal and electrical conductivity.

California Science Standards: **Investigation and Experimentation**

9. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:

- a. Plan and conduct a scientific investigation to test a hypothesis.
- b. Evaluate the accuracy and reproducibility of data.
- c. Distinguish between variable and controlled parameters in a test.
- e. Construct appropriate graphs from data and develop quantitative statements about the relationships between variables.
- f. Apply simple mathematic relationships to determine a missing quantity in a mathematic expression, given the two remaining terms (including $\text{speed} = \text{distance} / \text{time}$, $\text{density} = \text{mass} / \text{volume}$, $\text{force} = \text{pressure} \cdot \text{area}$, $\text{volume} = \text{area} \cdot \text{height}$).

Lesson Plan Relevance To Externship

This lesson is directly related to Buetler Corporations' goal of effective energy conservation of home and commercial building design. Students will mimic the corporations' processes of identification, estimation and application of energy conservation technologies in new home construction.

Student Deliverables	1 Exceeds Expectations			
Quality				
Labeling				
Scientific/Technical Items included				
Creativity				

Rubric for the Group Energy Presentation

Student Deliverables	1 Exceeds Expectations	2 Meets Expectations	3 Approaches Expectations	4 Fails to meet Expectations
Content				
Collaboration				
Organization				
Presentation				