



Home Sweet Eco-Home Models and Materials: Sustainability By Design

In today's world "*sustainability*", or "*green design*", is a topic of increasing importance. With growing populations vying for finite resources, the increase in material costs, and the changes in our climate, it is in our best interest, as individuals and as a species, to learn to lessen the impact we have on our environment and save some money in the process. This extension project is designed to offer students an **authentic learning experience** integrating **materials science** with **sustainable building design practices** as they create **models** to support learning, instruction and 21st century skill development.



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Materials

Green building materials and technologies are characterized by their energy efficiency and minimal impact on the environment. Energy efficiency considerations include the embodied energy of building materials and includes a study of the relationship between building materials, construction processes and their environmental impact. Students are challenged to design a sustainable house by selecting their building materials, insulating materials and energy sources.

Building	Insulation	Energy

Connection to Standards

California Career and Technical Standards

- ED.A.A1.2 Understand the development of architectural and design efficiency, and safety.
- ED.A.A3.0 Students understand the relationship between architectural and the external environment:
- ED.AA3.2 Develop a site analysis that considers passive energy techniques, sustainability issues, and landscaping.
- ED.AA4.0 Students understand the mechanics and properties of structural materials.

California Science Content Standards

Energy in the Earth System

- 4. Energy enters the Earth's system primarily as solar radiation and eventually escapes as heat.
 - b. Students know the fate of incoming solar radiation in terms of reflection, absorption, and photosynthesis.
 - c. Students know the different atmospheric gases that absorb the Earth's thermal radiation and the mechanism and significance of the greenhouse effect.

Investigation and Experimentation

- 7. Scientific progress is made by asking meaningful questions and conducting careful investigations
 - 7m. Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include choice of energy sources and material.

Authentic Learning and Assessment

Instructional Design

Authentic learning, like traditional apprenticeship, bridges the gap between formal classroom learning and the real-life application of the knowledge in the work environment. Learning by doing is generally considered the most effective way to learn and often produces the best results. Students are exposed to complex problems or challenges for which they have to analyze information, evaluate processes, communicate and collaborate with others, and create solutions. With authentic learning, students utilize diverse resources to access multidisciplinary information, beyond the teacher and textbook. Students also have choices in many of the tasks, meeting individualized learning styles and needs. Along the way, they develop creativity and perseverance. Often seamless, assessment of concepts and skills is accomplished through demonstration and presentation rather than just written test. Experiential, or action learning allows for more formative assessment to take place; allowing the teacher to interact individually or with small groups to check student progress. The most important factor of the authentic learning experience is community participation.

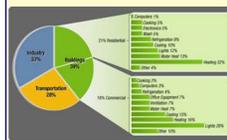
Project Components

Students form teams of six and select a topic related to sustainable home design. Working with a teacher mentor and in ideal cases additional community mentors, students complete project components by implementing their ideas, measuring and communicating project impacts and reflecting upon the learning process.

- Lesson Plan and Delivery
- Service-Learning Project
- Research Proposal
- Creative Presentation Using Multi-media
- Digital and Notebook Portfolio

Students select a topic related to sustainable home design.

Energy Conservation



Students collaborate to plan and teach a lesson to younger students.

LED Holiday Gift Tags



Students implement a service-learning project.

Super Saturday Event



Students use 21st century IT and communication tools.

Web Page and PSA



Models

In the field of architectural design, models or mock-ups are used by designers to acquire feedback early on in the design process. In the classroom, they effectively serve a similar purpose. By providing a discussion medium for student and teacher, formative assessment of student understanding is woven seamlessly into the task in a manner that reflects real-world evaluation processes. They can also facilitate collaboration across disciplines serving as communication tools.

2 D	3 D	Simulation

- 1. Google SketchUp
- 2. Hand Drawing
- 3. Single Room
- 4. Home Mock-up
- 5. Computer Game
- 6. Internet Lesson

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