

**DESIGN VIGNETTES**

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**DEMONSTRATION/DISCUSSION**

**Educational Goals**:

 Students will:

* Learn how wooden structures are built in the United States
* Get an understanding of and some experience with U.S. construction techniques
* Experiment with design choices , both in the structure and the materials
* Learn critical thinking in choosing design options
* Get hands-on experience with the processes involved with cutting wood and materials to build structures
* Get opportunity to be creative in decorating their structures

Ov**erview**: This module consists of taking “raw” materials such as scaled 2 x 4, 2 x 6, and 2 x 12 boards, and “sheathing and painted gypsum board” made of colored construction paper, to build one of three designs with different roof styles. The designs consist of Plan A: Gable Roof, Plan B: Shed Roof, and Plan C: Butterfly Roof.

Each design has a similar floor plan of similar size, with different window placements and roof design for each of the Plan Types. The students will follow scaled plans to build the walls, floor, and roof, in panels, and then assemble the panels into a complete structure. Options in window designs exist for Plan A, and options for all the plans exist in the form of the window, door, and skylight assemblies. Thus, students can build the simple structure, or they can add windows, skylights, solatubes, and doors.

**Content:** There is no power point for this module. It consists of plans, materials, a handout showing framing diagrams and picture examples, and verbal instruction.

**Time**: Approximately 6-8 hours to describe the projects, go through the plans, demonstrate the materials and methods of construction, and build the structures. Mentor is to figure out how many sessions that equates to for their school site.

**Materials Needed**:

* Set of plans on 24” x 36” paper. **NOTE: Mentor to ascertain before requesting prints from Lynn how many of which plan type they need.**
* Structural Shapes and Forces Booklets (should have a primer on structural shapes and forces before starting this module for general understanding of elements of the building and the shapes represented)
* Scaled balsa wood in 2 x 4, 2 x 6, and 2 x 12 increments.
* Colored construction paper in multiple colors to be used for outside and inside wall and roof sheathing, flooring, etc. Students can draw detail on the paper before gluing in place on surfaces.
* 4 sheets of clear 8.5” x 11” acetate to simulate glass in windows and skylights.
* Low-temp glue guns to attach materials together. Alternate: quick-drying wood glue.
* 10” x 15” foam-core boards for base to attach structures to. One per structure.
* 20” x 30” foam-core board to pin drawings to and build walls on. One per structure.
* Small “nails” to attach framing materials together with.
* Pliers to push nails into wood framing with.
* Chopper cutting device to cut wood with.
* Scissors to cut paper with.
* Markers or colored pencils, along with pens, to draw designs on construction paper to make siding, flooring, shingles, and interior design elements to decorate the structure according to the student’s desires.

**Directions**:

Suggest taking a few moments to discuss the project coming up and give a verbal overview, such as “We are going to learn how to build houses using scale wood and decorate them according to your own designs. We will learn how to read plans, cut wood and follow directions to build actual scale-model houses which you can then decorate your own way”. ***Bonus:*** Use the Structural Forces and Shapes Packet to show how Post and Beam framing shapes with butt joints work, their weaknesses, and how they need to be strengthened with sheathing to keep from racking, which is what occurs in these structures.

Start by going through the plans first with all the students around a table so the project can be overviewed before starting, and so all the students understand what the project outcome is, how the materials are to be used, what the process of construction is, methods of cutting, gluing, nailing, etc., and how assembly of the panels is accomplished. Go over rules about the cutters, glue guns, nails and pliers, and the importance of patience and craftsmanship, so as to not ruin the structures or have really cruddy looking models when done.

Then give out the handout showing framing diagrams and pictures for reference. Show them the materials and demonstrate how to cut the wood with the chopper, showing them how to measure carefully and not to waste, just like in real life. Demonstrate how to glue the wood together and then put a nail in it. Demonstrate how to read the plans and build right on the plans to scale. Demonstrate how to put the panels together after they are all built to make a house out of them, especially how the wall tabs go together. Demonstrate the options available—clerestory windows, skylights, window frames, and solatubes. Show how they can frame a door if they want in lieu of a window.

Note: the window, door, skylight, and solatube build options are for those students who really “get” it and want to do more and are ahead of the class in building. Suggest those who want the skylight or door option, but are not able to handle the actual window or door construction, to just cut the holes where they want for their design, and leave it at that.

**Topics to Discuss**:

Discuss how buildings are built in this country, using wood and nails, just like in these models

 Discuss where the finished wood elements come from (trees, taken to sawmills and cut into pieces usable in the building of houses. Can discuss sustainable forest practices here if workable).

Talk about critical thinking and problem solving skills using materials in hand, so they do not make mistakes while building

Share the importance of following directions carefully to get the desired result

Share the “green” aspects of cutting carefully and thinking it out so as to not waste materials

Discuss solar orientation relative to the models—including the use of overhangs in the summer to keep sun out and make house cooler in summer, and warmer in winter with sun coming in below the overhang; Also, discuss cross ventilation and dark/light colors relative to heat absorption.

Discuss the benefits of skylights or solatubes to bring balance to the light inside a building. Also how this keeps the lighting bill down.

Discuss the value of decorating to make a building come alive…color, texture, material types, etc.

M**entor Notes**: This is a medium-difficulty module. There is a lot to it and it has a lot of options, so it is incumbent upon the mentor to make sure he/she is familiar with the process of the cutting and assembling of materials, as well as some sense of design in general to guide the student into making good choices as to material use, craftsmanship (try to exhort them to be careful and not be sloppy), and the use of color, light, and material to make a good living environment. Also, discussing the solar orientation and placement of windows and roofs can lead to a discussion about green design saving energy and costing the same for a well-designed structure as a regular structure.

Would also suggest, since the drawings cost a lot and materials are limited, that the mentor try to get each student to build a different style, so all styles are used, and not everyone builds the same structure, so the plans are fully utilized and shared among the students*. If materials allow, then each student can build their own structure. If they do not allow, then suggest groups of three to four, to build one structure, working together in teams with one measuring, one cutting, one gluing, and one assembling, the jobs rotating each week so each student gets experience in each phase of the work. The decorating can be done by committee, sharing ideas and each student contributing to the whole, just like design teams do in reality.*