

LESSON OVERVIEW

Lesson 4 Subject and Topic: Building a Greenhouse

Grade Level(s): 6-8

Brief Description of Lesson: Participants will design and begin building a Lean-to Greenhouse.

STAGE 1: IDENTIFY DESIRED RESULTS

- **Enduring Understanding(s):**
 - Greenhouses provide shelter in which suitable environment is maintained for plants.
 - Energy from the sun provides light and radiates heat to the greenhouse, which will absorb the heat to raise the temperature inside the greenhouse, improving the environment for the plants to grow.
 - The greenhouse needs to absorb heat from the sun and not allow it to escape; needs to exchange carbon dioxide and oxygen; maintain humidity; and needs to regulate fertilizer in soil.
 - The greenhouse should be located in the south or southeast side of a building, where it gets maximum sunlight all day or morning sunlight.

- **Essential question(s):**
 - Why do we need a greenhouse?
 - What type of energy is used for plant growth?
 - What are the requirements for building a greenhouse?
 - Where should the greenhouse be place?

- **Standards**
 - Next Generation Science Standards
 - MS-PS4-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
 - Common Core State Standards
 - CCSS.Math.Content.6.SP.B.5b Summarize numerical data sets in relation to their context, such as by describing the nature of the attribute under investigation, including how it was measured and its units of measurement.

- **CCSS Standard for Mathematical Practice:**
 - CCSS.Math.Practice.MP2 Reason abstractly and quantitatively.

- **Key Content Knowledge and Skills**
 - Students will know:
 - A greenhouse is a structure used for growing plants throughout the seasons.

- The main element required for a greenhouse is good sunlight all day or morning sunlight.

Students will be able to:

- Determine the optimal sunlight conditions throughout the seasons.
- Learn various types of greenhouses available for growing plants.

Academic Language Knowledge and Skills

- Students will know: The basic requirements for plant growth
- Students will be able to: Explore various types of greenhouses and build one of their own.

English Language Development Knowledge and Skills (for starting, emerging, and developing ELLs)

- Students will know: Vocabulary list: Solar Radiation and Greenhouse.
- Students will be able to (define by audience, behavior, conditions): Use these terms in discussions with their peers and instructor.

STAGE 2: DETERMINE ACCEPTABLE EVIDENCE

Pre-requisite/Prior knowledge for Both Content and Language: N/A

Formative Assessment for Both Content and Language:

- Participants will be able to talk about what plants need in order to sustain and grow.
- Participants will be able to explore the various types of greenhouses.

Other Forms of Assessment

Assessment Criteria

- Participants will be able to experiment and perform activities to investigate the greenhouse effect.
- Summative Assessment (N/A)

STAGE 3: PLAN LEARNING EXPERIENCES

Time Required for Lesson Segments

- Set/Hook: 5 minutes
- Teacher Input: 15 minutes
- Guided Practice: 45 minutes
- Closure: 15 minutes

- **Grouping Arrangements**

- Whole class
- Small group(s)
- Pairs
- Cooperative groups
- Individual

- **Materials and Technology**

- Use the *People and Plants Lesson Plan Handbook* as an instructional tool.
- **Materials:** The instructor will need to collect materials from the Columbia College building at 623 S. Wabash in room 600N. The materials listed are for a group of 20 participants.
- **Forms:** Weekly Participant surveys

Building the greenhouse

- | | |
|--|------------------------------|
| · 2 Goggles | Wood Glue |
| · 4 Hammers | Markers, Pens, Pencil |
| · 40cm Square Dowels (14 Pieces per participant) | Heavy Paper to Cut triangles |
| · 2 Scratch Awl | 4 Saws and Mitre Box |
| · 8 Scissors | 10 Rulers |
| · 10 Rulers | Long term experiments |
| · Germinating seeds (Quality of Water) | |

Technology: Instructors will need to get access at their site, to use computers and a projector.

- Using a projector, the instructor will present the *People and Plants* powerpoint and show the *Scientists for Tomorrow* website.
- Participants are encouraged to take video and pictures to explain their findings at <https://www.facebook.com/ScientistsforTomorrow>

Teacher's Preparation

- Review the *People and Plants (PP)* lesson plan and watch video tutorials beforehand.
- Make copies of the Student Weekly Surveys
- The instructor should arrive at the site 15-30 minutes prior to the start of class.
- The instructor will set up work stations:

- Saw Station: goggles, saw and mounts
- Glue station: triangles, wood glue and participant's greenhouse frames

As participants arrive, teacher should take attendance so they can fully complete instructor log afterwards.

Differentiated or Individualized Learning (i.e. non-reader, ELL-levels, gifted): N/A

○ **SET/HOOK**

- In an open forum, while recording the responses on the board, the instructor will ask participants: How can we grow plants in the winter? What are the requirements for a greenhouse?

Participants will discuss with their peers and present their findings to the class.

- Instructor will discuss the outcomes of a greenhouse; needs to absorb heat (energy of the sun needs to enter but not escape); needs to be able to maintain humidity; needs to regulate fertilizer in soil.
- Anticipated Time: 15 minutes
- Pre-requisite/prior knowledge: N/A
- Formative Assessment: Observation and participation

DEMONSTRATION/LECTURE:

- **Designing the Greenhouse Activity-** The instructor will divide the classroom into five groups of three or four participants. Each group will have 14 pieces of 40cm square wood dowels. The instructor. In a sheet of drawing paper each group will design the biggest greenhouse structure using the square dowels. The participants will present their findings to the class.

- The instructor will discuss various types and structures of greenhouses.

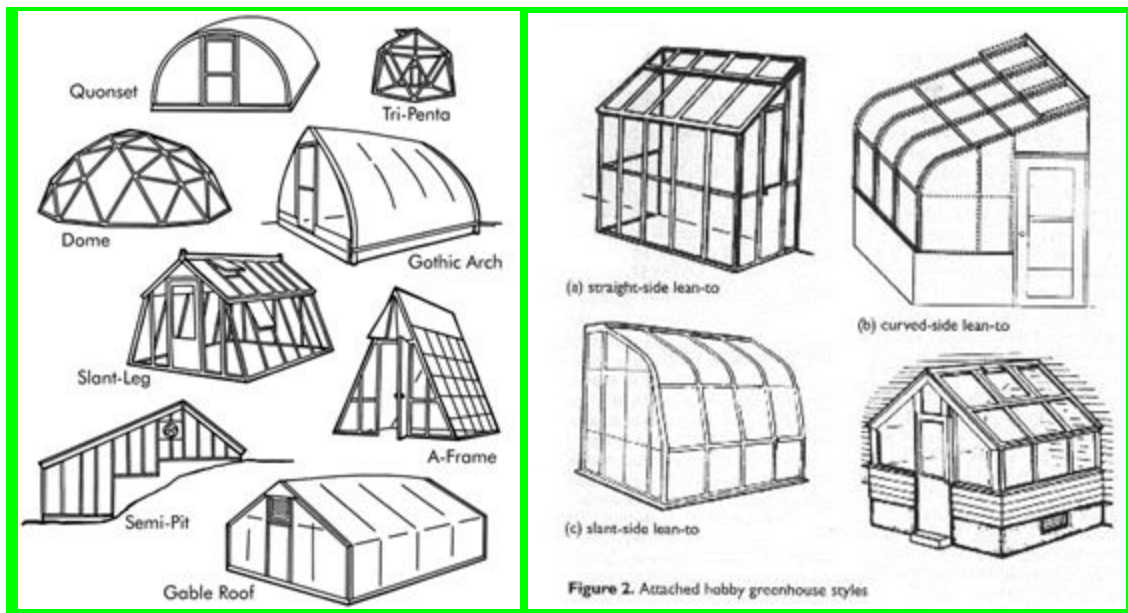
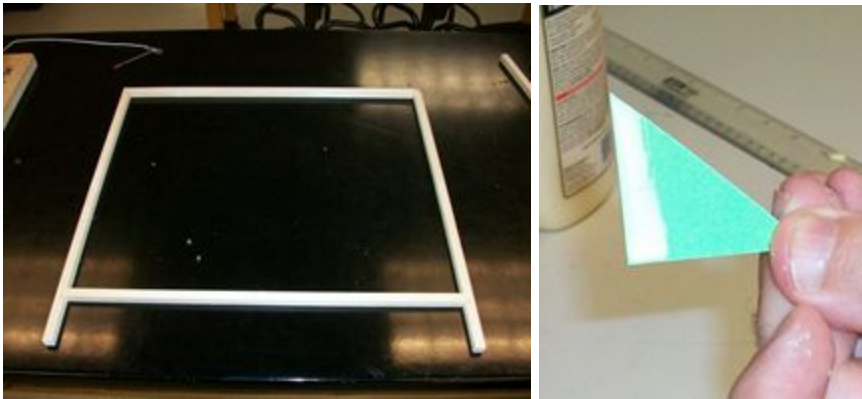


Figure 2. Attached hobby greenhouse styles

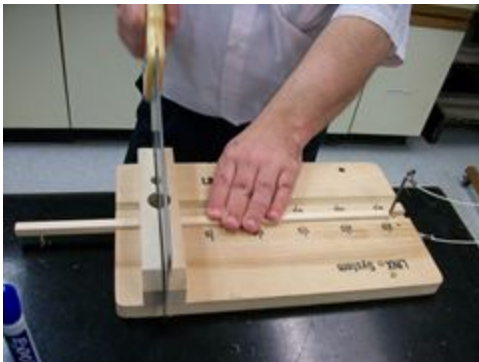
○ **Building the Greenhouse:** The instructor will demonstrate how to build a greenhouse: See Pictures below

- **Back Wall:** Each participant will build the Back Wall of their greenhouse using four (40cm) square dowels, leaving 5cm at the bottom as a stand. (See Below)
- Participants will then make right triangles by cutting the manila folders into 4cm right triangles. Using Wood glue, they will glue the right triangles onto the corners of the square dowels so it can hold the dowels together.



Using manila paper cut triangles to use as corner supports

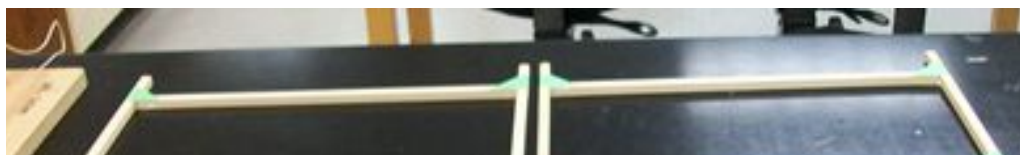
- **Front Wall:** Each participant will then build the Front Wall of their greenhouse using four (40cm) square dowels. They will cut two of the square dowels at 26 cm with a saw and mount and then form a rectangle using two 40cm square dowels and two 26 cm square dowels. Using Wood glue, they will cut and glue right triangles onto the corners of the square dowels so it can hold the dowels together.

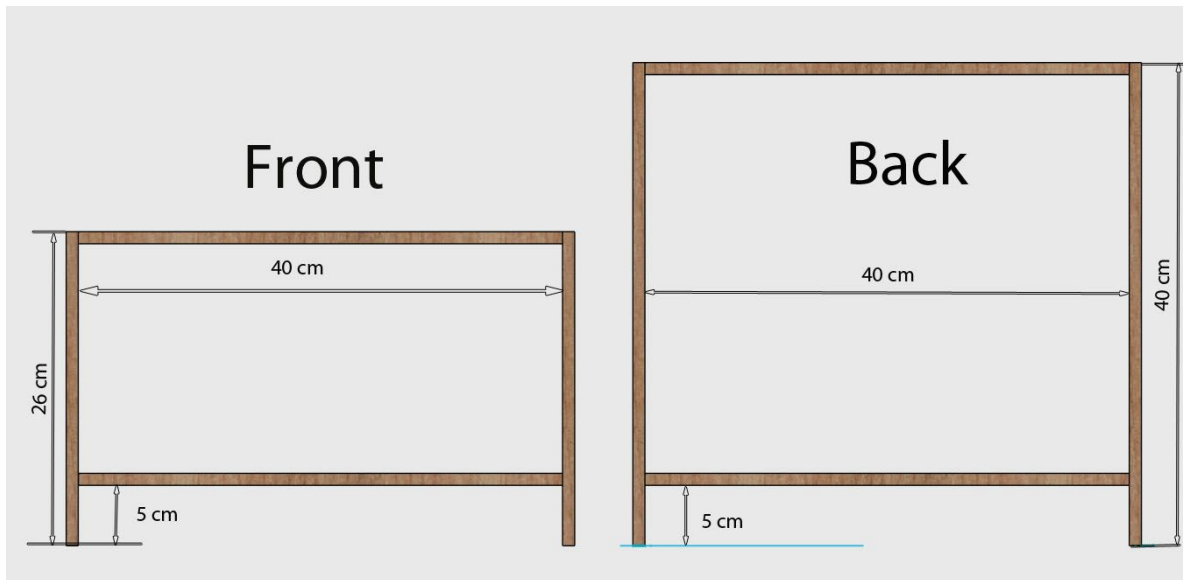


Designing and building the greenhouse.

Back wall

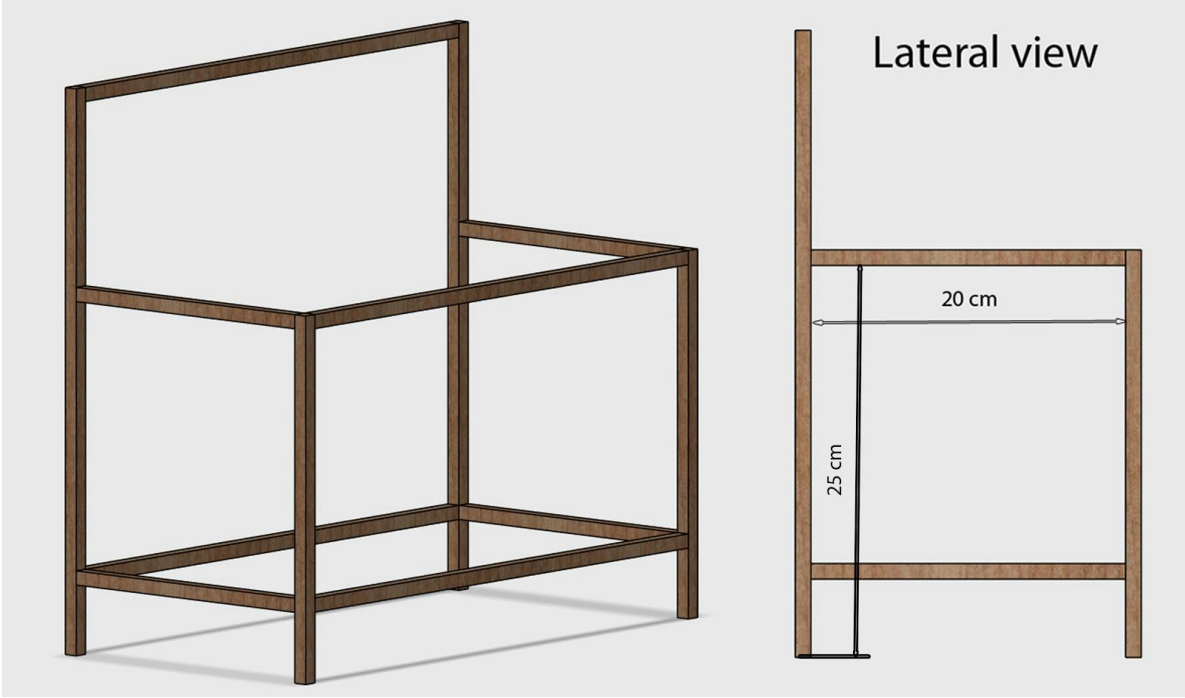
Front wall





Side Walls: Each participant will cut four pieces of square dowels of 20 cm long. Glue into place as sidewall support. Glue the right triangles, to the top corner and 35cm from the bottom from the Back Wall of the greenhouse.





Anticipated Time: 45 minutes

- Pre-requisite/prior knowledge: Photosynthesis and Plant Growth
- Formative Assessment: Observation and participation

- **GUIDED STUDENT PRACTICE**

- Anticipated Time: 40min
- Pre-requisite/prior knowledge:
- Formative Assessment:

- **INDEPENDENT STUDENT PRACTICE**

- Participants should visit the *Scientists for Tomorrow* website, as well as to visit Pinterest, Vimeo and Facebook, so they understand that they are in an important program.

- **CLOSURE**

- Review of what was learned in the lesson.
- Instructor will discuss how they think we need to close the greenhouse to retain the heat and humidity

Instructors will complete and submit activity journals at www.sft.org/logs

- Anticipated Time: 5 minutes