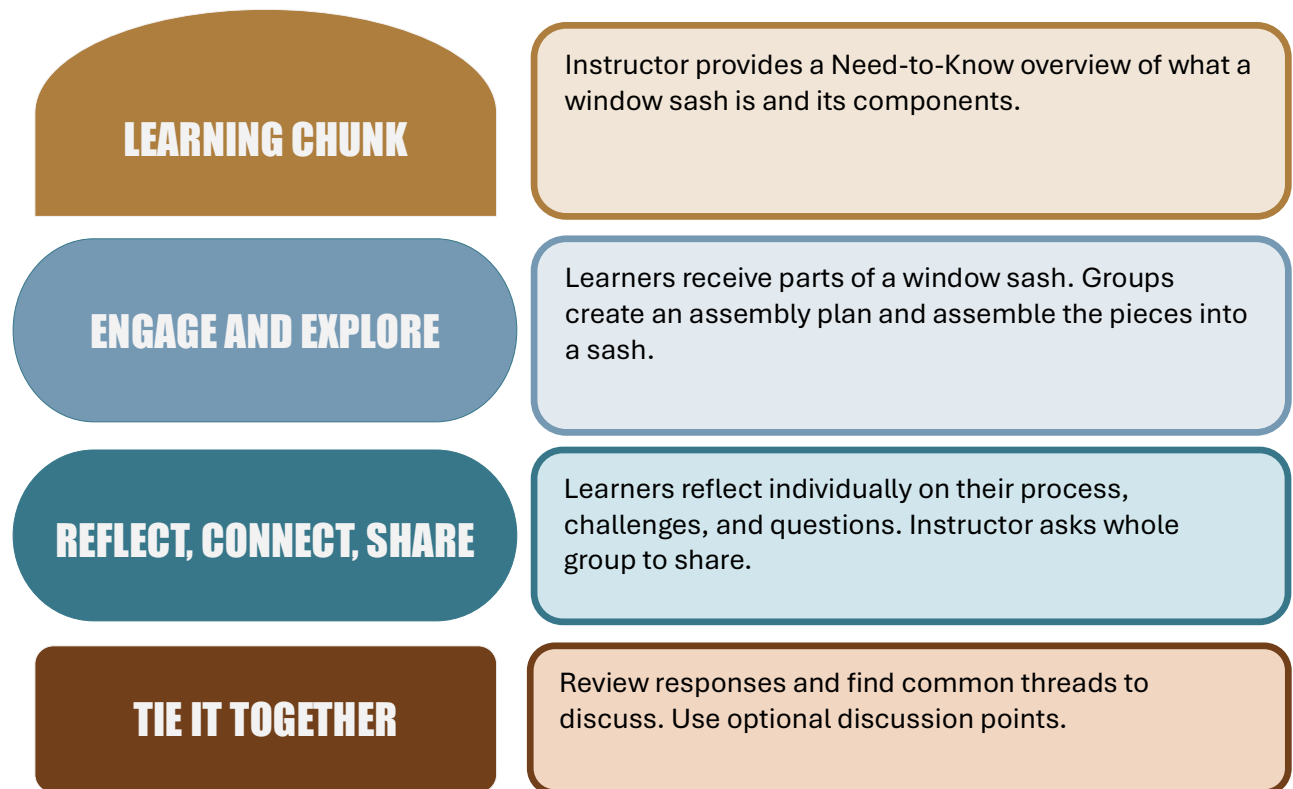


GOAL

Learners understand window sash components and assembly.

OVERVIEW

Instructor scaffolds learners to experiment and explore the components and construction of wood window sashes. Pieces of a window sash are needed for this lab.



MATERIALS AND EQUIPMENT

- Learning Resources:
 - Window sash diagram (included)
 - Learner notebooks
 - Large notepad
 - Markers
 - Pencils
- Tools:
 - Mallet (optional)
- Supplies:
 - Painter's Tape
 - Window sash components:
 - Rails
 - Muntins
 - Stiles

SET-UP

Arrange tables or surfaces for groups of 2 – 4. The individuals in the group should be facing each other. On each table, set out 1+ notepad, a roll of painter's tape, markers, pencils, window sash components, and a mallet, if needed. Put the large notepad in a location each learner can see easily. Provide a window diagram on each table or in large format with the large notepad.

Alternatively, the instructor can draw a simple window sash and mark components as they talk. You can provide the drawing after the lab and before they reflect.

WALKTHROUGH**Total time: 60 - 90 minutes**

5 minutes Instructor breaks everyone into groups of 2 - 3 individuals.

5 - 10 minutes Instructor asks learners what they know about windows. Use this to gauge their level of knowledge. Then, go through the "Need-to-Know" information.

1 minute Instructor asks students to come up with one question based on the Need-to-Know information, and to write it in their notebook.

1 minute Instructor provides instructions to groups:

10 - 15 minutes In front of you are pieces of a window sash. Using the diagram, work with your group to write a step-by-step plan to reassemble the window sash.

15 - 20 minutes Now, use your plan and assemble your sash. Note when and why you deviate from your plan.

5 - 10 minutes Instructor calls time. Then, ask individuals to reflect in their notebook about the process and any questions or challenges they had.

10 - 15 minutes Instructor then asks for 3 - 5 people to share challenges, and 3 - 5 people to share questions. Instructor writes this on the large notepad for everyone to see.

10 - 15 minutes Instructor assesses the feedback. Identify common threads and provide ideas on how learners can approach the subjects going forward, share resources where they can learn more, and/or ask the learners for their observations. Provide direct answers as needed, but try to scaffold the learners to find ways to answers independently.

NEED-TO-KNOW

1. What is a window sash?

A window sash is the part of a window that holds the glass. It is usually separate from the window box, which holds the sash and is connected to the building framework. Sashes are also often the moving part of a window.

- Optional: Discuss how windows move, and why sashes sit in window boxes.

2. What are the parts of a window sash?

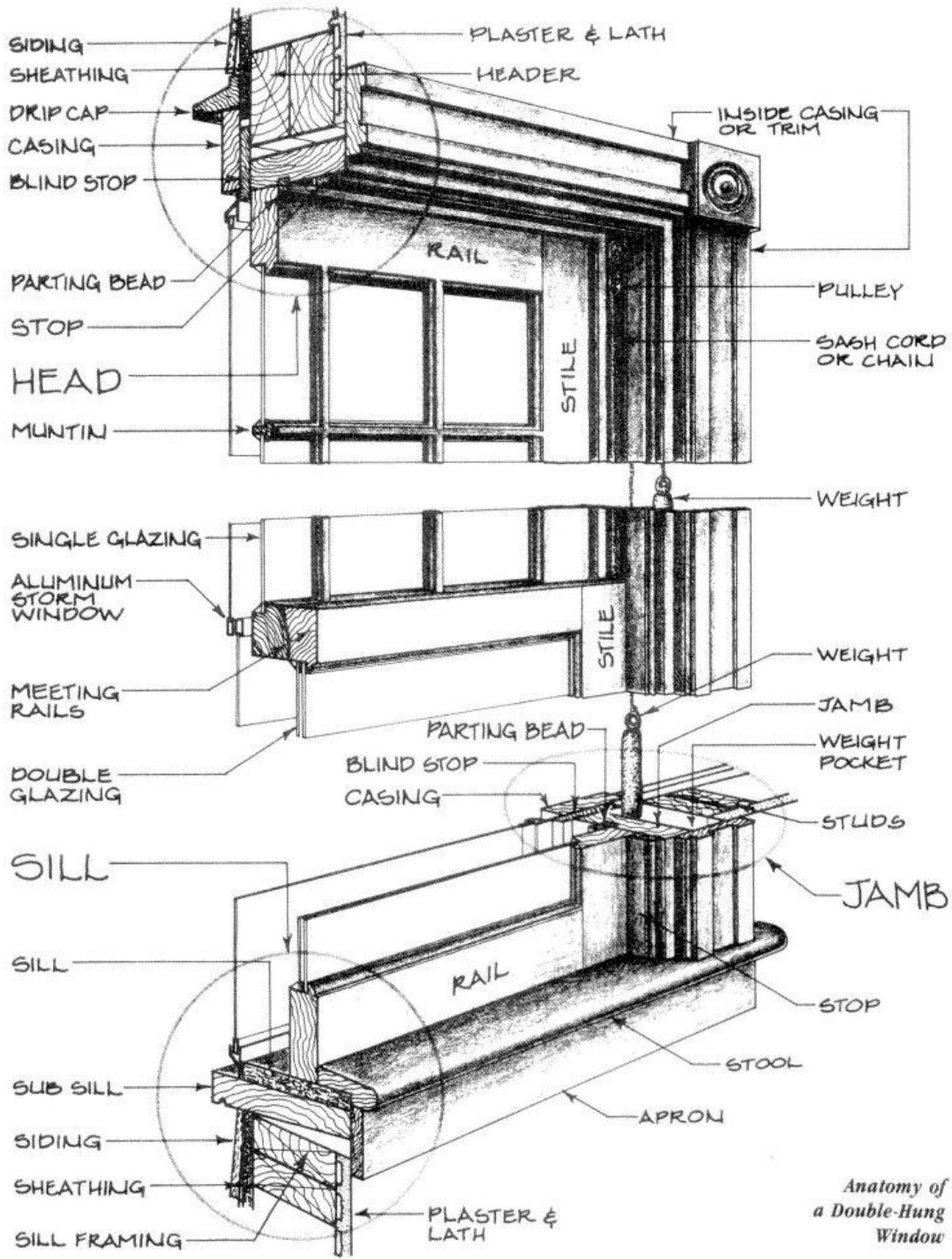
See diagram included for visuals. The rails of a window sash are the horizontal top and bottom pieces. They hold a lot of the load/weight from the materials in the sash. The stiles are the vertical pieces on each side of the sash. Muntins are the vertical and horizontal pieces in between the rails and stiles. They hold the glass.

- Optional: Discuss the profiles of these pieces, and how these are assembled are important to the character of a building.

3. What is joinery?

Joinery is the method of joining these wood pieces. Window sashes traditionally use a mortise and tenon system. A mortise is a specially-shaped hole, and a tenon is specially-shaped to fit in a mortise. Window sashes often have this because it is strong but flexible. It provides the strength needed to hold the materials in a window. It also is not so rigid that the connection will break with extreme weather changes or high use, like metal fasteners can.

- Optional: Discuss metal fasteners and how they can fail in wood windows.
- Optional: Discuss different types of mortise and tenon joinery, such as blind or through tenons.



Anatomy of a Double-Hung Window

HELPFUL TIPS

- Try to answer content questions after the learners do the lab. It is important for them to analyze the materials on hand and come to solutions together. If they ask content questions, return with leading questions like:
 - “That’s a good question. Let’s look at the materials and think about it. Which pieces have similar sizes or shapes? Why might that be?”
 - “I love that question. Other people might also be wondering this or want to know the answer too. Write that down in your notebook and share it after the lab for us to discuss.”
- Do answer any questions needed for learners to perform the lab. They should feel a little uncomfortable solving these puzzles, but they should not be frustrated. They will not be able to learn anything if they feel frustrated.
- Extend the lab with questions for discussion. See what the learners answer before providing more information. They may also come up with great follow-up questions. Some ideas:
 - Where does the glass go? How does it stay in place?
 - Which side faces inside? Which side faces outside?
 - Which is the top, and which is the bottom?
 - How do you think this window opens?
- Challenge advanced students by:
 - Adding extra sash pieces to their materials. Have learners figure out which ones do not belong.
 - Include sash pieces with different profiles. Encourage them to observe why the profile matters in assembly.
- Encourage learners to assist in clean-up of materials.