

Visible Elements in Photo



- Wooden structural framing (vertical studs, horizontal beams, angled roof trusses)
- Fiberglass or mineral wool insulation material (gray/tan batts between studs)
- Large multi-pane window (8–9 panes) with light cyan-colored glass
- Wooden roof with exposed beam framework and small roof vents
- Interior wooden floor/platform
- Metal brackets or connectors joining structural members

Reasonable Inferences

1. From insulation + window + framing: This is a new building under construction designed to retain heat or regulate indoor temperature—likely a shed, cabin, or agricultural structure.
2. From roof vents + large window: The structure is being designed to balance natural light and passive ventilation while maintaining thermal control.
3. From wooden construction + insulation placement: The builder prioritizes sustainable or locally available materials (wood framing) combined with energy efficiency.

Engineering Task

K-2 Challenge:

Build a Cozy Box House

Imagine you are making a small house for animals (or toys). Your job is to build a box structure that keeps the inside warm and lets in light.

- Use a cardboard box as your frame.
- Add a window (cut a small square and cover it with clear plastic or cellophane).
- Stuff newspaper or cotton balls inside the walls to keep warmth in.
- Test: Put your hand inside—does it feel cozy? Can you see light through the window?

Success: Your box has a working window, insulation stuffed inside, and feels warmer than a box with no insulation.

3-5 Challenge:

Design an Insulated Structure with Thermal & Light Control

You are designing a small storage shed that must:

- Keep the inside 5°C warmer than outside (using insulation material)
- Allow natural light in without losing too much heat (strategic window sizing)
- Use only sustainable or recycled materials (wood frames, recycled insulation, cardboard)
- Fit within a 30 cm x 30 cm x 25 cm footprint

Measurable Criteria:

- Record temperature inside vs. outside every 5 minutes for 30 minutes
- Measure the total window area (in cm²) as a percentage of wall area
- Identify what material you used for insulation and why it was chosen
- Sketch your design showing insulation placement and window location

Success Condition: Interior temperature exceeds exterior by at least 3°C within 20 minutes; structure withstands a gentle push without collapsing.

EDP Phase Targeted

Ask / Define Problem !• Best fit for this photo

Why: The photo shows a real-world structure mid-construction with visible design choices (insulation placement, window size, frame design). Students should first identify the problem the builder was trying to solve: "How do you create a space that is warm in winter, has natural light, and uses sustainable materials?" This grounds their engineering work in authentic human need before they imagine or build solutions.

Suggested Materials

1. Cardboard boxes or wooden frames (repurposed materials)
2. Fiberglass insulation batts, newspaper, or cotton balls (thermal insulation)
3. Clear plastic wrap or cellophane sheets (window simulation)
4. Wooden dowels, popsicle sticks, or straws (structural framing)
5. Thermometers (to measure and compare temperature change)
6. Tape, glue, or fasteners (assembly)

Estimated Time

- K-2: 40–50 minutes (30 min building + 10–15 min testing/observation)
- 3–5: Two 35–40 minute sessions (Session 1: Design & build; Session 2: Test & record data)

Why This Works for Teachers

This task directly supports NGSS ETS1.A (defining engineering problems) and ETS1.B (developing solutions) by having students recognize that structures must balance competing priorities—insulation for efficiency, windows for light, and sustainable material use—mirroring real architectural decisions.