

### Visible Elements in Photo



- A snow-covered wooden cart or wagon with large metal-rimmed wheels on a frozen lake
- Heavy snow accumulation on the cart's wooden bed and wheels
- Evergreen tree (coniferous) laden with snow on the left side
- Bare deciduous trees in the background
- Frozen lake surface extending into the distance
- Clear winter landscape with ice, snow, and frozen water

### Reasonable Inferences

- From cart structure: The cart was designed to be pulled or pushed across flat terrain; the wheels suggest it needs to roll efficiently on frozen surfaces, but snow buildup is reducing mobility and function.
- From snow accumulation: Heavy, wet snow adheres to exposed surfaces; the cart's design does not shed snow easily, suggesting a need for angled surfaces or smoother materials to prevent ice/snow bonding.
- From frozen lake setting: Objects left outside in winter weather experience extreme conditions (freezing, thawing cycles, salt exposure if in road areas), requiring protective or weather-resistant designs.

### Engineering Task

#### K-2 Challenge:

Your wagon got stuck in the snow! Design a way to help it roll better across icy ground. You can wrap it with smooth materials, tilt parts so snow slides off, or make special "snow shoes" for the wheels. What will keep your wagon moving through the winter?

#### 3-5 Challenge:

The wooden cart in the photo loses mobility when snow and ice build up on its wheels and bed. Your challenge: Design a protective or snow-shedding modification to the cart that:

- Reduces snow and ice adhesion to the wheel rims and wooden surfaces
- Maintains the ability to roll smoothly on frozen terrain
- Can be added to (or built from) the existing cart without removing the wheels
- Uses only materials available in a winter environment or classroom

Success criteria: Your design must allow a model cart to roll at least 1 meter farther than an unmodified version across a snow-covered surface.

### EDP Phase Targeted

Ask / Define Problem — This real-world winter scene presents a clear, visible challenge: a functional object becoming impaired by environmental conditions. Students can directly observe the problem (snow-clogged wheels) and identify the need for improvement without being told what to fix. This naturally invites questioning: "Why is the cart stuck? What would help it move?"

### Suggested Materials

- Wooden blocks or small carts (or cardboard boxes as substitutes)
- Aluminum foil, plastic wrap, or wax paper (smooth surfaces to reduce snow adhesion)
- Foam insulation or craft foam (lightweight, moldable)
- Wooden dowels or straws (wheel axles for model carts)
- Dry rice, artificial snow, or crushed ice (to simulate snow buildup in classroom)

### Estimated Time

45–60 minutes (One full class period or two shorter sessions): 10 min problem observation, 15 min planning/sketching, 20 min building, 10 min testing and comparison.

### Why This Works for Teachers

This task directly addresses NGSS 3-5-ETS1-1 (Define a simple design problem reflecting a real need or want) by grounding the engineering challenge in a tangible winter survival scenario, encouraging students to identify constraints and test solutions iteratively.