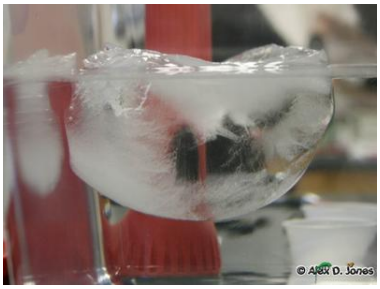
# Ice

Physical Science | Engineering Design Process

**Engineering Challenge**

## Visible Elements in Photo




- A clear, dome-shaped soap bubble with a thin, reflective membrane
- Colorful background (red and darker surfaces) visible through the bubble
- Bubble surface showing iridescent colors (white, hints of red and black reflections)
- The bubble appears to be suspended or floating, intact but delicate
- Indoor setting with blurred objects in background (suggests a classroom or lab environment)

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## Reasonable Inferences

- From bubble structure: The thin elastic skin suggests the bubble is filled with air at a slightly different pressure than the surrounding environment, which allows it to hold its shape temporarily.
- From delicate appearance: Bubbles are vulnerable to puncture, evaporation, and air pressure changes—a design that needs protection or stabilization to be useful.
- From indoor setting: This appears to be part of a hands-on activity or demonstration, implying students could recreate and test bubble-making conditions.

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## Engineering Task

**K-2 Challenge:**

"Design a Bubble Catcher"
Make a tool that can hold a bubble without popping it. Use string, paper, or plastic to build a cage or net that will let the bubble sit safely inside. Test it by making bubbles and trying to catch them. How long can your bubble stay safe?

#### 3-5 Version
"Design a Bubble-Protection Enclosure"
Create a sealed or semi-sealed container using recyclable materials (plastic wrap, straws, paper tubes) that can house a soap bubble for at least 2 minutes without it popping. Your design must:
- Allow you to see the bubble clearly
- Protect the bubble from air currents and accidental contact
- Use only materials from the provided list
- Be testable and reusable for at least 3 trials

Success = bubble remains intact for the full 2-minute timer period.

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## EDP Phase Targeted

Ask / Define Problem
This photo shows a delicate structure with an obvious vulnerability (bubbles pop easily). Students naturally encounter this problem when making bubbles, making the challenge authentic and grounded in direct experience. The task asks "How can we keep something fragile safe?" before jumping to building, which centers the problem-definition phase.

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## Suggested Materials

1. Plastic wrap or cellophane sheets – for creating transparent barriers
2. Paper towel tubes or toilet paper tubes – for frame or structural support
3. Bubble solution and wands – to generate test bubbles
4. String or yarn – for bracing and creating protective frameworks
5. Index cards or poster board – to build walls or shields around the bubble

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## Estimated Time

Two 30-minute sessions – First session: design, build, and initial testing; Second session: refine design based on failures, retest, and document results.

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## Why This Works for Teachers

This task directly addresses NGSS ETS1.A (Defining and Delimiting a Problem) by asking students to identify constraints (fragility, air pressure, evaporation) and design within them—turning a familiar object into an authentic engineering challenge.