

JANUARY
Dream Big Science Camp — Teacher's Guide
MONDAY

EXPERIMENT 4 — Build the Biggest Floating Boat

Time: 1:30 – 2:30 PM

Goal: Design a boat that floats and holds the most weight (pennies/washers). Test buoyancy and displacement.

Format: Individual or small-team builds (students may work individually or in teams of 2)

Materials (for ~20 kids)

- Heavy-duty aluminum foil (12"×12" sheets) — 30 sheets (20 + spares)
- Plastic tubs (large, to test multiple boats at once) — 4
- Washers or pennies for weighing — ~1000 washers (or 2000 pennies)
- Craft foam sheets or craft sticks (for reinforcement) — 20 sheets / 200 sticks
- Modeling clay (for ballast) — 2 lb
- Duct tape & masking tape — 3 rolls
- Scissors — 6 pairs
- Rulers — 5

<https://a.co/d/htITWwI> or <https://a.co/d/80k0qbT> - DIY boats

Step-by-step

1. Explain buoyancy: an object floats if it displaces a volume of water whose weight is equal to the object's weight (Archimedes' principle). Discuss shape and stability.
2. Give each student/team a sheet of foil and optional foam or sticks to strengthen hull. Challenge: design a boat that holds the most washers without sinking. Predict how many washers your boat will hold.
3. Build (20–25 min).
4. Test: place boat in tub and add washers one at a time until water spills or boat sinks. Record number of washers.
5. Debrief: Which hull shapes worked best? Did a wide, shallow boat hold more than a narrow, tall one?

Chemistry/Physics Connection

Buoyancy is governed by density: materials denser than water sink; less dense structures that displace more water float. The arrangement of materials and sealing (chemistry of surface tension, wettability) affects how water interacts with the hull.

Safety notes (critical)

- Adult-only: heating, hot water, cutting heavy materials, and handling raw eggs (dispose properly).
- Provide gloves and aprons for messy tasks.
- Have a first aid kit and allergy info at hand (especially for eggs).
- Keep work areas ventilated and have paper towels/wipes/garbage close.
- Eye protection optional for egg-drop and tower testing if pieces may fly.

Clean-up checklist (end of each experiment)

- Remove large debris into trash bags.
- Wipe tables with disinfectant.

- Rinse and dry reusable bins/trays.
- Label and store student take-home items (slime bags, boats).
- Sweep floor; check for spilled cornstarch, glitter, or pennies.

Assessment & reflection prompts (use at 2:30 share-out)

- What was your design goal and did you reach it? Why or why not?
- Which material surprised you the most and why?
- How did chemistry help your design (slime, oobleck, adhesives, buoyancy)?
- If you had more time or money, what would you change?

Differentiation ideas (ages 5–11)

- Younger kids (5–7): focus on guided roles and simpler measurement (tall/short; float/sink). Provide templates and more teacher assistance.
- Older kids (8–11): add quantitative tests (record cm of stretch; test tower failure force by counting washers; compare number of washers supported and calculate approximate mass supported). Encourage iterative redesigns and mini-reports.

Quick shopping list (one place to order)

- Paper cups (100)
- Popsicle sticks (200)
- Plastic straws (200)
- Masking tape (6 rolls) / duct tape (3 rolls)
- Glue sticks (10) / liquid glue (optional)
- Cardboard bases (6)
- Rulers (5), scissors (6)
- Rubber bands (100)
- Index cards (100)
- Baking soda / vinegar (for mini tests or cleaning)
- White school glue — 5 x 16 oz bottles
- Liquid starch — 3 x 32 oz bottles
- Food coloring sets (4) / glitter jars (optional)
- Ziplock bags (25)
- Cornstarch — ~40 cups worth (buy 2 × 5 lb bags or 1 × 10 lb bag)
- Disposable mixing tubs & trays (6)
- Raw eggs — 12 (plus plastic eggs for practice)
- Bubble wrap / cotton batting / craft foam / balloons / string / washers / pennies (~1000 washers or 2000 pennies)
- Heavy-duty aluminum foil — 30 sheets (or one roll large and cut)
- Plastic tubs for boat testing — 4 large
- Modeling clay — 2 lb
- Paper towels, disinfectant wipes, trash bags

Include 2-3 experiments for extended kids.