

SciGirls Activity 12

Anchors Aweigh!



Icebreaker:
Stretch your mind and learn simple chemistry by making Funny Putty!

SciGirls Skill: Measuring



You'll need:

- 1/4 cup white glue
- 1 teaspoon household borax
- 1 cup water
- 8 oz paper cup
- wooden stirrer

Guide your girls as they:

- 1) Dissolve the borax in the cup of water.
- 2) Pour the glue into the paper cup.
- 3) Add 1/4 cup of the borax water to the glue, and stir really well. Notice how the glue changes!
- 4) The glue turns into a blob! Go ahead and pick it up with your hands, and start kneading it and stretching it. How far can you stretch the blob without breaking it? Why do you think this works?



SciGirls Suggestion: This is a great group activity, as you can mix up a lot of the putty and give each girl her own ball. Or you can also assign three or four girls per bowl of putty, and have the teams add different amounts of each ingredient. What happens?



For more information on this gooey investigation, go to pbskids.org/dragonflytv/superdoit/funny_putty.html.

Investigation:

Milk Carton Boats

Use common materials to make a boat that floats.

We're Ciara, Brittney and Maria, and we recently had a very "mooo-ving" experience: We built a boat entirely out of milk cartons to enter in a hometown race! Using 150 milk cartons, we had to design a boat that would carry all three of us. Our SciGirls question: **What boat shape or design is most effective?**



For each group of three girls, you'll need:

- 1/2 pint milk cartons, 30 per group of 3 girls
- 1/2 gallon milk cartons, 100 per full size boat you intend to make
- packing tape
- 2-liter soda bottles, one per group
- sand to fill the 2-liter bottles
- 6 fishing bobbers, fish line and weights for each bobber
- stopwatch
- metric tape measure about 10 meters



For more seaworthy information, go to <http://pbskids.org/dragonflytv/show/milkcartonboat.html>. Then surf to pbskids.org/dragonflytv/contact/index.html to tell us what you learned!



Check out this investigation on Tape 2, Segment 12.



SciGirls Want to Know: What boat hull design will help us win a milk carton boat race?

Guide your girls as they:

- 1) Use 1/2 pint cartons to fashion a model of each specific boat shape. Tape the cartons together with packing tape.
- 2) Set up bobbers (anchored with fish line and weights) in a shallow wading pond or pool. Space the bobbers 1 meter apart. Set up 6-8 bobbers in a line. Perform the following tests:

Glide test: Give each boat a push from behind the first bobber, releasing it as its bow reaches the first bobber. Send it in a direction parallel to the line of bobbers. Let it glide until it comes to a stop (or nearly so). Record the point of farthest advance of the boat's bow, as indicated by the bobbers. Estimate to the nearest 0.1 meter. Perform multiple trials for each boat.

Maneuverability test: Place a 2-liter bottle with sand on the model. Attach a pull-string to the bow of the boat. Pull the boat through the bobbers, alternating as in a slalom course, and a fairly brisk speed. Observe the number of bobbers successfully navigated (i.e., boat does not bump into them).

Stability test: For every 15 cartons on your boat that touch the water, fill a 2 liter soda bottle with sand. Tape the sand bottle onto the boat model. Use the tow-string to pull the boat, with sand, quickly through the water. Look for signs of tippiness, plowing, or other indications of instability.



SciGirls Secret:

Recent graduation data shows that many more women are entering the various engineering fields, but girls often miss out on primary engineering experiences like taking stuff apart and putting it back together, or just building stuff! Give them opportunities to tinker with cast-off computers, circuitry, or just their own bicycles. Older girls can even take basic auto maintenance or repair classes. Learning to be confident and comfortable with these experiences sets the stage for later vocational paths.



SciGirls Synthesize: Data and Analysis

Here are Ciara, Brittney and Maria's results. You can use this table to guide you in analyzing your own data.

Test	Glide	Maneuverability (Bobbers navigated)	Stability
Raft	198 cm (6.5 ft)	4 out of 5	Stable
Catamaran	260 cm (8.5 ft)	3 out of 5	Bow tipped down
V-hull	183 cm (6.0 ft)	Sank (waterlogged for other tests)	

See Appendix A for a graphing example.

Conclusion:

The DFTV girls found that the V-hull was ineffective, but the raft and catamaran each had strengths and weaknesses. The stability of the raft and the glide of the catamaran suggested making a "combo" or hybrid design utilizing features of each. Ciara, Brittney and Maria built a "catama-raft" using 150 half-gallon cartons (enough to support 600 lbs of passengers), and placed second in their heat at the Minneapolis Aquatennial Milk Carton Boat Races. What did you find out?

Keep Exploring!

How does the shape of a sail affect how well a sailboat zips along? Build a simple milk carton boat and make some different sail shapes to find out. Take it to a lake or pool when there's a nice breeze and see how well each sail catches the wind.