

## Balloon Skewer Relay Race

**Summary:** This turns a very cool polymer structure demo into a physically active competition that is just silly enough to make high school kids love it. It is one of the highlights of Materials Camp at UAB every summer. A short video of the campers in action is included on *Nanohub*.

**Time:** 15-20 minutes

### Materials:

- Balloons (normal round ones, about 2x the number of participants)
- Bamboo barbecue skewers (one package)
- Liquid dish soap (using two bottles with different colored soap is fun)
- Paper towels
- Two rolling desk chairs

**Materials Science:** Polymers are made up of long chains of carbon molecules, which are mostly tangled together like noodles in a bowl of spaghetti. Because it's hard for these tangled molecules to pack together very tightly, the density of polymers is usually quite low compared to metals and ceramics. Polymers are also relatively soft and weak, so that normally, when you press something sharp into a balloon, the balloon pops. However, with a little help from some "magic liquid" it's possible to skewer a balloon without popping it. By coating the tip of a bamboo skewer with dish soap, the pointy tip becomes slippery enough to slide between the loosely packed polymer chains and pierce the polymer without popping it.

**Demo:** Squirt a small amount of dish soap onto a folded paper towel, and use it to coat the tip of a bamboo skewer. Carefully push the skewer into the balloon on one side and out the other. *Tips:* This works best when the balloon is only blown up about halfway. Go in near the bottom of the balloon by the knot and come out at the very top where the plastic is thicker. Twisting the skewer back and forth a little as you press it against the balloon also seems to help.

**Activity:** Have the kids help you blow up all the balloons and place them into a single container (like a large trash can). Mark a starting line and finish line at opposite ends of a large hallway. (15-20 yards seems about the right length.) Place the two chairs on the starting line, with the container of balloons between them. At the finish line, place two piles of skewers and two folded paper towels with a squirt of soap on each.

Divide the participants into two groups. Have each group line up behind one of the chairs. The first person in each line should take a balloon and sit down in the chair. When the race starts, the second person in line must push the chair down to the finish line, where person #1 will jump out, use a paper towel to soap up just the tip of a skewer, and attempt to skewer their balloon. Meanwhile, person #2 will roll the chair back to the starting position, grab a balloon, and sit down, with person #3 in place behind them as the next chair pusher. Once person #1 has either successfully skewered their balloon or popped it, they will drop the skewer, run back

to the starting line, and tag person #2, who will then take off down the hallway, being pushed by person #3. The race continues until all the balloons are gone. The team with the most successfully skewered balloons wins.

**Suggestions for the activity leader:**

- Practice your skewering technique ahead of time. It takes some finesse to make this work. Also, some balloons seem to work better than others (don't buy the very, very cheap ones).
- Make sure the kids see your technique for successful balloon skewering. Particularly tell them to go through the top and bottom; otherwise it won't work at all, which makes for a sad game.
- Have a helper standing behind the skewers to add more soap as necessary. If you let the kids do it, they'll squirt out too much and it gets to be a mess. You only need to add more soap occasionally.
- The soap minder can also make sure kids don't run off with a skewer in their hand.
- Have someone keep count of how many successfully skewered balloons each team has, and call out the number occasionally so everyone knows where the score stands.
- The skewers can be reused almost infinitely, and one bottle of dish soap lasts a long time as long as you don't let the kids squirt it themselves, giving this activity a high bang-for-the-buck ratio.

