

## Teacher Notes

This activity is an intense exercise that will likely involve triumphs, failure, and heated team discussions. However, it is through this intensity that the most learning occurs. This is a relatively involved exercise, with a pre-homework assignment, 3 hour in class activity, and post-homework reflection (not to mention the hardware preparation and mess). However, the time commitment is necessary to get students engaged and push themselves to be creative and learn through the iterative nature of the design process.

### Nominal Materials Needed

- Water Balloons
- Syringes to fill up balloons with repeatable amount of water.
- Bucket to hold balloons
- Ladder, and or balcony or window to drop balloons out of
- Rubber bands
- Tape
- String

### Variations in Material Choice

This activity was inspired by the egg drop contest, which is very popular and Google searches will reveal many creative design solutions, such as a parachute. To create a new an “uncontaminated” design challenge one can simply modify the kit parts. In the current implementation MegaBlocks (large lego type blocks) are used purposely to avoid the parachute concept. However, one could add:

- a small bit of bubble wrap, which most teams would likely use to wrap the water balloon, but some may turn into a parachute.
- Foamcore/cardboard/paper and hot melt glue or tape.
- Used plastic bags from eh grocery store (good for cushioning)
- Ballons. They could be blown up for cushions. You will have to decide if you allow a water balloon to be blown up inside antoehr baool; since it does strengthen it quite a bit.

You may decide to drop the devices on a rubber mat to reduce damage to the Megablocks, but please let the students know this ahead of time so that the rules are well defined.

### Filling Up the Balloons

To make the contest fair the repeatable, all balloons should be filled up with the same amount of water. If necessary you can have the students do the filling, and place all balloon in a communal bucket; this way there is no incentive to underfill and get a struier balloon. Some methods are:

- Use [large syringe](#)
- Large turkey baster

- Drill hole through the bottom of cheap plastic cup, large enough to fit a finger through. Over fill the balloon and before tying the knot, put the balloon inside the upside down cup with the balloon neck sticking through the hole. Press the cup down and flush with the table to press out excess water. Then tie the balloon.

### **Logistics of Preparation**

To make the contest fair it is important that each water balloon be filled with the same amount of water, which is done with the syringe. If you do not have teaching assistants, you can have the students prepare the water balloons, but then put them in a communal bucket so there is no incentive to “cheat” and under fill one’s balloons. Also one will need:

- Ladder for short drops (and window or stairwell for higher drops)
- High speed video camera such as
- Possible rubber mat to reduce block breakage

### **Why Individual Concept Generation and Why as Homework?**

Each student is asked to come up with 4 design concepts independently before the team meets as a group. In fact this can be done even before teams are formed. The reason for this, is that a one team member may dominate discussion of design concepts if the team starts barnstorming right off the bat. The individual approach gets all students involved in this phase, and results in a wider range of design concepts. The concept generation is done as a homework assignment to give students enough time to really delve into the creative process. If individuals are only given 15 minutes to create design process, then one misses aspects such as attachment to certain design concepts, and preconceived notions of what might work. Also assigning concept generation as a homework assignment saves valuable class time and gets students ready to be engaged when the actual drop occurs. It is recommended to give students 3-7 days to think about the challenge and do the homework.

### **Why Force Teams to Work on One Concept at a Time?**

If there are team conflicts it is likely to be around which design approach to pursue. If one lets team members pursue their own concepts individually, it avoids essential team discussion and agreements that are required in longer term projects where it is not feasible to pursue multiple approaches in parallel. Because of the iterative nature of this project, students who don’t get their design chosen in the first round can work to convince their teammates to try their approach in a following round.

### **High Speed Video**

Fun, adds a science component, becoming increasingly prevalent. Will require some trial and error. Often video needs to be downloaded to a computer to allow quick fastforward.

### **Documentation**

Everynote and Skitch