Lesson Plan for Egg Drop

The goal of this event is to create the smallest possible container that will prevent an egg from breaking when it is dropped from the top of a five story parking garage. Hopefully the kids will get a better understanding of forces and shock absorbing by the end of the event. The smallest container (by volume; the volume of a parachute (if they add a parachute) is its volume when unopened) that successfully keeps its egg from breaking wins. Also, the tutor must be able to get to the egg in a reasonable amount of time (~30 sec or so).

Introduction(10 minutes)

Hold an egg (in a sealed bag) above your head. Ask the kids what will happen if you drop it. Hopefully they will suggest that the egg will break. Drop the egg.

Ask them why the egg broke. Someone will probably say because it hit the ground. Ask them what will happen if you drop the egg from a very small height. If the distance is small enough, the egg won't break (demonstrate if you need to). Ask them why the egg will break if dropped from a large distance, but not if dropped from a short distance. Get them to figure out that the egg breaks when it hits the ground while it is moving too fast. Suggest that they could prevent the egg from breaking by slowing it down. It may be best to start of list of things to do to prevent egg breakage (this would be #1).

Now ask them if an egg will always break if it hits someone's hand when dropped from a long distance (it will). Now ask them what would happen if the person moved their hand when the egg hit it (to gently catch it): it won't break. Feel free to demonstrate this. Now ask them why moving your hand when the egg hits keeps it from breaking. The key idea here is that

you are extending the time of impact. This is the idea of cushioning and shock absorption. This would be number 2 on the list. Crumple zones are cars are an obvious example.

Another important idea is that of distributing the force of impact. Ask the kids if you have to push harder on the egg to break it if you a) push on it with a pen or b) push on it with your palms. The answer is b. Important thing #3: distribute the force on the egg. In practice this is done by molding the cushioning material around the egg instead of simply having the egg rest on a flat cushion.

One last idea (not as important) is that you need the cushioning in the direction of impact. This is easily demonstrated by asking: does it do any good to put cushioning on the back of the egg? Important idea: put the shock absorption where it is needed (the kids can use weight or drag to make sure their devices fall on the correct side). Of course, it is also an option to pad each side of the egg and not worry about which way it will fall.

Design (10 minutes)

The kids will have a large variety of materials (boxes, bottles, cups, rubber bands, bubble-wrap, balloons, garbage bags, etc) to create their egg-saving devices. Try to prevent the kids from hoarding and/or wasting material (they tend to this with there is no set limit on material available). Have the kids draw their design for the egg drop using the available materials.

Build (30 minutes)

Important: After they have a reasonable device that they think will work (and ONLY AFTER), they can get an egg in a bag for testing.

It is probably a good idea to tell them that they only get one egg.

Test (15 minutes)

Tutors can drop the eggs from various heights (the roof of the school has been used in the past) or throw the devices to test them.