

Stemmies Experiment - Week 4: Save the egg!

Egg Drop Experiments

Materials:

- Balloons
- Baggie
- Cotton balls
- Bubble pockets
- Bubble wrap
- Toilet paper rolls
- Straws
- Tape
- Rubber band
- Cups (2 sizes)
- Egg (you supply)

Instructions:

Using the materials provided in your bag and items you find at home, build a pod that can keep an egg from breaking when dropped from a very high location. You will have to supply the eggs. DROPPING MUST be done by parent for safety reasons. You can use the materials provided as well as ones from home. The key is to keep your egg safe! Watch my video for some example builds done at my house....keep watching and see if I was successful or if we have scrambled eggs☺. Remember to save excess items for next weeks experiment!

What this experiment demonstrates:

Egg drop projects help us explore basic concepts such as gravity, force and acceleration. In an egg drop project, the specific details and rules may vary. The general idea is to have you design a container that will allow an egg to safely fall from varying heights without breaking. One of the goals is to try and use the least amount of material as possible. Egg drop projects combine problem solving skills with basic principles of engineering and physics. This demonstrates that the more you put on your egg to keep it safe, the heavier it becomes, and the more gravity pulls on it. For more information look below.

Now get to work – SAVE THAT EGG!!!

Laws of Motion

The science behind solving the falling egg "problem" is found in Sir Isaac Newton's laws of motion. The first law states that an object at rest will stay at rest, and an object in motion will stay in motion, unless acted upon by an external unbalanced force. This law means that if the forces acting on a falling egg are equal, it will remain in its current state of motion. If a force greater than those acting on the egg is applied, it will accelerate. "Acceleration" means any change in velocity -- slowing down, speeding up or changing direction. If you hold an egg, the forces you are applying are equal and balanced, canceling out the force of gravity. Therefore, it remains motionless in your hand. If you let go of the egg, gravity becomes an unbalanced force and causes the egg to fall to the ground.

Force, Mass and Acceleration

Newton's second law deals with the relationship between an object's mass, its acceleration and the amount of force it exerts. The heavier an object is, and the faster it is traveling, the more force it exerts. Gravity causes falling objects to accelerate at a rate of 32.2 feet per second squared. By reducing the amount of mass in the egg container, you are reducing the amount of force it exerts as it falls.

Equal and Opposite

Newton's third law states that for every action, there is an equal and opposite reaction. That means when you exert a force on an object, the object exerts a force back on you. For example, if you were standing on a boat and pushed off of the dock, even though you were pushing the dock, the dock pushed back. This is what causes the boat to move away from the dock. This concept is useful in understanding why an egg breaks when it strikes the ground; the ground is returning the force from the egg as it meets the ground. Using shock-absorbing materials can help reduce the amount of force exchanged between the ground and the egg.

Conservation of Energy

The law of conservation of energy helps understand how to mitigate the effect of an egg that is falling to the ground. Energy can neither be created nor destroyed, only transferred. When an object falls to the ground, some of its energy is transferred to the ground, while it retains some energy. This is why a ball may bounce lower and lower each time. Eventually, the kinetic energy dissipates and the ball stops bouncing. By understanding that kinetic energy from a fall can be diminished over time, students can attempt to minimize the force of impact from a falling egg by using materials that allow for a bounce.