Egg Drop Project
By: Mara Yella
Drafting P2 B Days
**Design Brief**

Client: *HSMSE Drafting Teachers: Ms. Carlisle, Mr. Choi*

Target Consumer: *HSMSE Drafting Teachers: Ms. Carlisle, Mr. Choi*

Problem Statement: *Egg must survive a 20 foot drop*

Design Statement: *Container design will keep egg intact after a 20 foot drop*

Constraints:
- Must be completely made out of cardboard
  - No tape or other types of fasteners
  - Type of cardboard: Corrugated cardboard
- Must be able to survive multiple trials/drops
- Must be as light as possible

**Background Research**

1. What are Newton's 3 laws of motion?

   *First Law of Motion:* Objects at rest stay at rest and objects in motion stay in motion unless external forces are applied. (*Law of Inertia)*

   *Second Law of Motion:* Force is equal to mass times acceleration. (*F = ma)*

   *Third Law of Motion:* For every action there is an equal and opposite reaction.

2. What is the scientific process?

   The scientific process is the process that is undergone so one can answer questions and respond to problems. The typical steps are to first ask a question, then do background research, construct a hypothesis, do the experiment, analyze and draw conclusions, and finally communicate the results.

3. What are variables? What is a dependent and independent variable?

   Variables are things that can change. The independent variable is the variable that you change but isn’t changed by anything else. The dependant variable is what changes based on how the independent variable was changed.

4. If you were to drop an egg from a high elevation, what do you PREDICT would happen?

   If you were to drop an egg from a high elevation, I think it would crack when it hits the ground, unless it was protected in some way.
5. What is gravity? What is the speed of gravity; how fast would an unprotected egg fall?

    Gravity is the force that attracts mass towards the center of the earth or other large planetary body. The speed of gravity is about 9.8 meters per second. An unprotected egg would fall at about 10.93 meters per second.

6. Will the egg ever reach the speed of gravity (aka free fall)? Why or why not?

    The egg will never reach the speed of gravity because it has too much air resistance and drag.

7. What is air resistance? And what are the 2 most common factors that have an effect of air resistance?

    Air resistance is the forces in the air that act against an object moving through it. The two most common factors that have an effect on air resistance are speed of the object and the area of the object that is colliding with the molecules in the air. Both factors when increased will cause the object to have more air resistance.

8. Why do more massive objects fall faster than less massive objects?

    More massive objects fall faster than less massive objects because air resistance acts more upon less massive objects, slowing their fall to the ground.

9. What is momentum? How is it changed?

    Momentum is the force of the speed of an object. If an object moves faster, it has a great amount of momentum.

10. What is an impulse?

    An impulse is the change in momentum of an object.

11. There are 3 collisions in a crash, what are they and explain what happens.

    There’s the collision between the outside or exterior of the object and whatever it ends up crashing with. The next collision is the crash between whatever is inside the object and the sides or interior of the object. Lastly, there’s the collision between the whatever is inside the object and it’s insides. Relating to a car crash, the collisions would be, the collision between the car and another object (car, wall,
etc.), the collision between the people inside the car and the sides of the car, and also the collision between the internal organs inside of a person.

12. Name at least 5 safety features of a car

- Seatbelts
- Airbags
- Mirrors
- Lights and turn signals
- Automatic Brakes
Plan and Design of Egg Container

1. Identify the problem and information you need to understand the problem (look back to the first page of your packet for help):

   The problem is that we need to make a container that would keep an egg intact during a 20 foot drop. The container can only be made out of cardboard and nothing else. Also, it’s supposed to be as light as possible.

2. Form a hypothesis based on how you will fix the problem presented in this project. (IF I DO THIS THEN THIS WILL HAPPEN)

   If I make a container out of cardboard that has supports to hold the egg, along with pieces on the bottom to act as somewhat of a cushion, then the egg would survive after a 20 foot drop.

3. Explore your solutions to the problem of the 3 collisions the egg will sustain, what materials will you use to solve the problem?

   With the first collision, the container colliding with the ground, the container has triangular cushions so the two boxes holding the egg don’t directly hit the ground. With the second collision, the main box holding the egg is held in place by a second box, therefore there’s almost no room for the inside box holding the egg to move. With the last collision, nothing is helping to fix this problem since the internal “organs” (yolk and whites) don’t really matter in this experiment.
4. Draw your container (use labels!) Teacher Initials

5. List the steps of how to make your container:

First, cut out the pieces needed for the container. Then, slide the triangular cushions through the base (largest square with slits in it). Then put the smaller square (sides of the outer box) on opposite corners of the smallest square (top of the outer box). Next, put the large rectangles with three slits (other two sides of the outer box) on the last two points of the smallest square from the last step. Make sure to put the square sides through the slits of the rectangular sides. But inside box inside the box just assembled. Lastly, put the rest of the rectangular sides through the base, making the inner and outer box rest on the triangular cushions.

6. List any changes to your container after a trial of dropping it?

After a trial of dropping it, I increased the length of the triangular cushions on the bottom so that there was more padding for the egg and its containers. Other than that, no changes were made since the egg survived the initial trial.
Fold this to make that
Reflection Questions

1. Was your hypothesis right? In other words, did you correctly state a hypothesis that was true after you dropped your egg?

   Yes, my hypothesis was correct. The cardboard cushions and the two boxes containing the egg were successful in keeping the egg intact.

2. Was your egg contraption successful? If so why? If not, why?

   My egg contraption was successful. It protected the egg during the drop. I think this is because of the extra cardboard padding and extra box surrounding the box that already contained the egg.

3. What could you have done to make your container more successful?

   I could have tried to find a way to make the container lighter. In other words, a more efficient way to keep the egg protected.

4. After watching the egg drops, who had the best design? What made their design different from yours?

   After watching the egg drops, I think that some of the best designs were ones with parachutes or some piece of cardboard that could slow down the container's descent. My design, instead of trying to decrease the force when the container hits the ground, was intended to cushion and absorb the full force so the egg didn’t get crushed.

5. What do you think the overall purpose of this project was?

   I think that the overall purpose of this project was to teach us about what happens when two objects collide and how to make it so that there were little to no damage to the object colliding into the other. The project could have also been given so we could learn and have more experience with creativity since we had to be very creative when thinking of how to design the container using just cardboard.

6. How could you relate these egg contraptions to real life situations?

   You can relate these egg contraptions, which protect delicate eggs from collisions, to vehicles, which need to protect people if there was ever an accident.

7. State one new thing you learned from this project.
I learned what things you can add to containers that help to either absorb or decrease the force of a collision.

8. Did you enjoy this project, if so why? And if not, why?

After finally deciding on a design, this project was actually pretty enjoyable. I enjoyed building the container and I especially enjoyed the final day of the project when we actually dropped the eggs.