



TEACHER ACTIVITY

HEAD PROTECTION

What does it take to design a killer—or, perhaps we should say *life-saving*—helmet? Find at least one other person to collaborate with as you work through the following steps and attempt to help an uncooked egg survive hitting a wall!

STEP 1: CONNECT

Think to yourself and share with your teammate: Have you ever worn a helmet before? Have you ever *not* worn a helmet when you probably should have? What professions require helmets?

STEP 2: INVESTIGATE

Helmets can be lifesaving—their goal is to prevent or reduce head trauma by absorbing some of the force from an impact. Head trauma is any damage to the scalp, brain, or skull caused by an injury. The most common type of head trauma are concussions.

Work together to learn more about concussions using the internet. You may find your own sources or use the ones below:

- Ted Ed: What happens when you have a concussion? youtu.be/xvjK-4NXRsM
- What is a Concussion? www.cdc.gov/headsup/basics/concussion_what.html
- Sports and Concussions kidshealth.org/en/teens/concussions-sports.html

STEP 3: DISCUSS

Did you know that the human brain develops until age 25? Based on what you learned about concussions, why may brain injuries in children or teenagers be especially harmful?

In what jobs, sports, or other activities do people normally wear helmets? Why?

Are there any jobs, sports, or activities that don't require helmets that you believe should possibly use them? Why, and in what circumstances, should they be worn?

STEP 4: MATERIALS

To prepare for the challenge, gather the following materials:

- Raw eggs, several
- Measuring tape
- Newspaper
- Helmet prototype materials of your choice, such as:
 - Tape
 - Newspaper or tissue paper
 - Modeling clay
 - Bubble wrap
 - Cotton balls
 - Paper towels
 - Craft wire
 - Packing peanuts

STEP 5: THE CHALLENGE

Now that you have some background information *and* your materials, imagine that you and your teammate are in charge of creating a model helmet to protect the human brain.

Cue: Uncooked egg! Use the materials you collected and your own creativity to design a model helmet that could successfully protect an egg from being thrown against a wall in two different ways (following a straight path *and* following a curved path) and from three different distances!

Talk through your ideas before you collaborate to build your helmet. Once your first prototype is complete, perform the trials described below and thoroughly examine your egg after each throw. If the egg cracks, swap it out for a new one before the next trial. Be sure to discuss what worked well and what could have worked better *before* making changes.

FOR LESS MESS

Hard boil your eggs! Place the eggs in a large pot covered with water. Bring the water to a boil, and then remove the pot from the heat. Let the eggs sit in the hot water for at least 12 minutes before running them under cool water. They'll now make less of a mess if they crack!

FOR AN ADDED CHALLENGE

Create a design that resembles a real helmet as much as possible. For instance...

Can it be easily removed from the egg and then put back on?

Does it show off part of the egg? If you can see part of the egg, draw a face on it

WANT TO LEARN MORE ABOUT THE MAGNUS EFFECT?

There are plenty of resources online to help you understand this scientific concept. For a starting point, check out <https://n.pr/3QQnJRZ>

Trial 1: Traditional Throw	Trial 2: Curved Throws
<p>First test your egg helmet by throwing it against a wall. Start at twenty-five feet away, then advance to twenty, fifteen, 10, and finally 5 feet away.</p> <p>Think about the speed at which balls can be thrown during a game, and do your best to throw your hardest each time!</p> <p><i>Pro Tip!</i> To know how fast you're actually throwing, download a free radar gun app onto your tablet or smart phone—such as the Pitch Counter & Radar Gun App for iOS or the Speed Gun App for Androids.</p>	<p>In sports, balls don't always follow a straight path. Soccer players can bend their kicks around defenders, pitchers can throw curveballs, and golf shots, tennis serves, and ping pong passes can veer to the right or left.</p> <p>Scientifically speaking, these curves occur because of the Magnus Effect: When a ball is thrown, kicked, or hit so that it pushes the air in one direction, the air pushes the ball in the <i>other</i> direction—producing a curve!</p> <p>Learn more about how to throw the perfect curveball here (wikihow.com/Throw-a-Curveball) or have a classmate show you how it's done!</p> <p>Then test your helmet by throwing a curve ball against a wall from twenty-five feet, twenty feet, fifteen feet, 10 feet, and 5 feet away.</p>

You're going to be thankful that you have some extra eggs handy!

STEP 6: SHARE

Once you have successfully protected a raw egg from cracking, create a three-minute Tik Tok video that shares what worked and what didn't work as you designed your helmet.

Try to explain a complication you encountered while testing, demonstrate the changes you made to overcome it, and reveal the success of your final product! Use the hashtags #InnovationAtPlay and #egghelmetchallenge so others can learn from your design, too!

NGSS STANDARDS

- HS-PS2-3. Apply science and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.

COMMON CORE ELA STANDARDS

- CCSS.ELA-LITERACY.CCRA.SL.4: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.