Objective: Students will be able to:
- Learn about the process of creating safety gear.
- Explore the concept of dispersing energy.
- Plan and conduct an experiment related to dispersing energy.

Time Required: 2 class periods

Materials Needed:
- Printed copies of the "Eggheads Student Challenge" worksheets for each student (included)
- Raw eggs
- (Optional) A variety of household materials such as:
  - Cotton balls
  - Tissue paper
  - Puffed rice or corn cereal
  - Plastic sandwich bags
  - Styrofoam packing peanuts
  - Styrofoam cups
  - Bubble wrap

Vocabulary:
**Disperse** - To spread out
**Impact** - A forceful contact of one body against another
Applicable Common Core State Standards:

**CCSS.ELA-Literacy.SL.6.1, SL.7.1, SL.8.1** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others’ ideas and expressing their own clearly.

**CCSS.ELA-Literacy.RST.6-8.3** Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

**CCSS.ELA-Literacy.WHST.6-8.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

**CCSS.ELA-Literacy.WHST.6-8.4** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Additional Relevant National Learning Standards:
(Based on Mid-continent Research for Education and Learning)

**Science. Standard 9. Level III [Grade 6-8].** Understands the sources and properties of energy

**Science. Standard 10. Level III [Grade 6-8].** Understands forces and motion

**Thinking and Reasoning. Standard 2. Level III [Grade 6-8].** Understands and applies basic principles of logic and reasoning

**Thinking and Reasoning. Standard 3. Level III [Grade 6-8].** Effectively uses mental processes that are based on identifying similarities and differences

**Thinking and Reasoning. Standard 4. Level III [Grade 6-8].** Understands and applies basic principles of hypothesis testing and scientific inquiry

**Technology. Standard 3. Level III [Grade 6-8].** Understands the relationships among science, technology, society, and the individual

**Technology. Standard 4. Level III [Grade 6-8].** Understands the nature of technological design

**Technology. Standard 6. Level III [Grade 6-8].** Understands the nature and uses of different forms of technology
1. To begin this lesson, ask students, "How many of you play a sport?" "How many of you play a sport that requires you to wear a helmet?" "Why are you required to wear a helmet?"

2. Discuss that all helmets (for any sport) attempt to protect an athlete's head by absorbing the energy from an impact. During a collision, energy is transferred from a moving object to another object (which may be stationary or moving). If the impact of a collision is absorbed in one concentrated area, one or both colliding objects could be damaged pretty badly. Helmets protect athletes by dispersing the energy from an impact over a wide area. Helmets also have a protective layer of dense foam padding inside which helps absorb the impact of a collision, sparing an athlete's fragile skull.

3. Helmets used for different purposes have different designs. Provide students with examples of different sports (you may also choose to show students a few examples of different types of helmets). Have students explain how each sport's helmet is designed with a specific purpose. For example, a helmet designed for rock climbing must protect against heavy impact, and against objects such as small rocks falling from above.

4. Explain that helmets are also designed with practical concerns in mind. For example, a bicycling helmet should be aerodynamic in shape and well ventilated. Hockey and football helmets have cages that protect the face.

5. Discuss that baseball players began experimenting with batting helmets as early as 1905. Batting helmets have to be strong and durable, as well as comfortable and lightweight. A variety of different types of helmets were tried, but it wasn't until the early 1940s, when plastics were developed that batting helmets really began to take shape.

6. By the late 1950s, Major League Baseball required that players use some form of head protection, but it didn't have to be a helmet. Ask students, “Why might a player choose to wear a helmet?” “Why might a player choose not to wear a helmet?” Batting helmets were finally required by Major League Baseball in 1971. Helmets with an ear flap were required starting in 1983. Today, the newest helmet models can withstand the impact of a 100 mph pitch.
1. Take an egg and tell students that if you wrap your hand around it and squeeze it evenly on all sides you can’t break it. Let a few students try this.

2. Then show students that a slight tap on a table will crack the shell. Ask students why they think that this happens. Discuss possible answers.

3. Explain that students will be conducting an experiment to demonstrate how a helmet protects an athlete by dispersing the energy from an impact.

4. Divide students into groups of 3-4.

5. Provide students with an "Eggheads Student Challenge" sheet. Each group must design a safety device that will allow an egg to be dropped from a height of 6-8 feet without breaking. Remind students that they must not alter the egg itself in any way (to make the egg stronger).

6. Give students a project deadline.

7. You may choose to have students work on their egg safety gear at home, or at school. If students are working at school, you may provide them with a variety of household materials such as the ones listed above. If students are working at home, you may want to give them some parameters for what materials to use.

8. Once the egg safety gear has been built, have each group fill in Section 2 on their experiment sheet. This will be their hypothesis about what will happen to their egg when it is dropped.

9. Take all groups, with their completed projects, to the site where they will drop the eggs.

10. After all the eggs are dropped, return to the classroom and discuss the results. Which gear worked best? Why?
Conclusion:

To conclude this lesson, groups should now complete Section 3 on their experiment sheet as they discuss why their protective gear worked well or why it failed to protect the egg. They will also formulate a conclusion about what they would do the same or differently, the next time they try to do the experiment.

To check for understanding, hold a class discussion in which you explore the similarities between the egg safety gear and helmets designed to protect athletes' heads. Why are helmets so important? What would happen if an athlete didn’t wear a helmet, or if the helmet failed?
Team Names: ___________________ Date: ___________________
_______________________
_______________________

The Task:

1. As a team, you must design a safety device that will allow an egg to be dropped from a height of 6-8 feet without breaking.

2. You may use any of the materials specified by your teacher.

3. Your safety gear will be inspected and collected by the teacher on lab day. No modifications or additions will be allowed after that time.

4. Do not bring your own egg on lab day - Your teacher will provide one for you.

Section 1: Safety Gear Design

In the space below, describe the design of your egg safety year. Include the dimensions and a list of materials needed to construct it.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Section 2: Safety Gear Hypothesis

In the space below, write down your hypothesis. What will happen to your egg when it is dropped? Why do you think so?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Section 3: Analyze Your Results

1. What happened to your egg when it was dropped?
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   ...
   ...
   ...

2. Did your safety gear work? Why or why not?
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3. If you were going to do this experiment again, what would you change about your design?
   ...
   ...
   ...
   ...