

## How Bike Helmets Work

### INTRODUCTION:

#### Objective/Learning Targets

The purpose of this lesson is to demonstrate the importance of wearing a helmet while riding a bike.

### RESOURCES

#### Materials:

- Bike helmets for show
- Eggs (or melon)
- Packing peanuts in a bag or container
- Hard surface (to drop egg on)

**Age Range:** elementary-aged students

**Time:** 1 hour

### Warm-Up / Before Activity

1. **Ask students the importance of wearing a bike helmet.** What would happen if they didn't wear a helmet? Why should you wear one?
2. **Watch the video from the Active Transportation Alliance.**
  - This demonstrates the difference between dropping a watermelon on the pavement with and without a bike helmet.
  - Ask the students if they expected that or not. Why did the watermelon with the helmet not break as much? Or why did the watermelon without the helmet break?
  - <https://www.youtube.com/watch?v=wF-Ft8FG2Mg>
3. **Talk about what a helmet is made of and how it will help you out in an accident situation. If you have a bike helmet, you can use that to show/demonstrate.**
  - Bike helmets have multiple components to them. The most important part is the liner of the helmet, or the foam layer. This is the layer that will absorb the energy of a crash impact. The most common type of foam used is called Expanded Polystyrene foam. EPS foam is also used in everyday applications like trays, plates, and it can be molded for insulation or packaging materials (like packing peanuts).

- The shell of the helmet is simply made of a thin layer of plastic, similar to the plastic used for bottled water. The shell is not only there for decoration, but it is also there to keep the helmet together and help you slide if you hit the ground, rather than coming to an abrupt stop.
- Another important part of the helmet is the straps. These are designed to keep the helmet snug and stay on your head in case of an accident.

#### 4. Watch the video from Snell about the importance of wearing a helmet.

- This demonstrates the importance of wearing a helmet with a metaphor of kids on a school bus breaking before hitting a wall. The video is a little dramatic, but there are some parts that make it easy to understand why you should wear a helmet.
- <https://www.youtube.com/watch?v=HA5bHYoIC1g>

## ACTIVITY/PROCESS

#### 5. Do a demonstration with the egg drop

- Talk about how an egg is fragile and has a protective outer shell, similar to our brains and skulls. The packing peanuts are similar to the Styrofoam in the helmet, which cushions the fall of the egg, just like the helmets.
- First, try dropping the egg on pavement. The egg should mostly likely break from the impact.
- Now try, dropping an egg into a bag of Styrofoam packing peanuts. The egg should be safe and unbroken after the fall. This demonstrates how bike helmets (which are primarily made from a hard type of Styrofoam) can protect your brain during an accident.

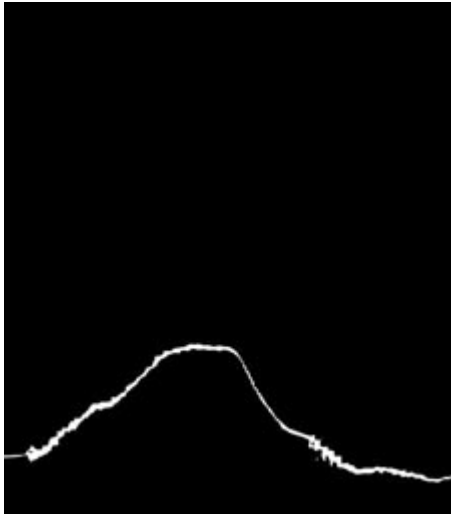
#### 6. Brief lesson on how a helmet works and the “physics” behind an impact (might be better for the older students)

- [How does a helmet work?](#)
- The point of a helmet is to increase the time it takes to bring your head to a complete stop in addition to spreading out the impact over a larger amount of surface area to minimize the impact. The surface area can be seen through the thumb tack example (from the Snell video), where it hurts more if you push against the sharp end of the tack and doesn't hurt if you push against the head of the tack. This is because the force and pressure is being more evenly distributed around a larger area.
- Helmets are designed with a layer of foam that is designed to be crushed to absorb the impact

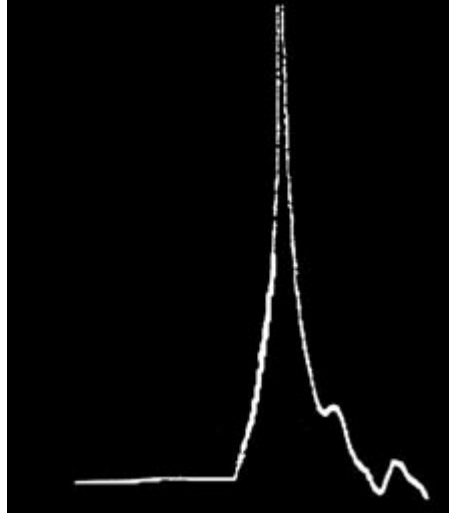
upon falling down. This in turns will reduce the impact of brain injury due to a fall. A helmet can reduce your head's stopping time by 6 milliseconds and also reduce the impact to your brain.

- These graphs show the impact energy the brain will see/feel with and without a helmet. The smooth curve shows the impact with a helmet and the impact spreads over the 6 milliseconds with a helmet. The huge spike shows the impact of a crash without a helmet.

*Impact With A Helmet*



*Impact Without a Helmet*



## CONCLUSION

Additional fun facts about helmets: taken from [Iowa Kids on the Move \(Lesson 14\)](#)

### *Saving Heads with Helmets:*

1. Each year 50,000 bicycle riders suffer serious head injuries
2. Of all bicycle deaths, 80% are due to head injuries
3. A bike helmet costs at least \$950 less than one trip to the hospital
4. You have only one head, and you need it.

### *A Good Helmet Has Five Characteristics*

1. Approval stamp of Snell or ANSI
2. Stiff and smooth outer shell to distribute impact and protect against sharp objects
3. Impact-absorbing liner made of polystyrene at least ½ inch thick
4. Forehead protection
5. Comfortable fit