HELMETS

Science in motion | Design for safety | Activity C4

INTRODUCTION

When it is difficult to observe something in real life, scientists often use a model to represent what is happening.

This activity uses an egg as a model of your head.

Think about the parts of an egg… an outer shell and a soft fragile centre. Your head has a hard skull protecting a soft fragile brain.

Things you'll need
2 eggs (hopefully you'll only need one!)
2 sandwich-sized zip lock bags
Soft stuffing - bubble wrap, polystyrene or tissue paper
Hard surface - a brick, hard floor or concrete area.

TEACHER DEMONSTRATION

Phase 1 – model of a head in a helmet

- Roll an egg in bubble wrap and sellotape the ends shut to hold it in place.
- 2/3 fill a sandwich-sized zip lock bag with more bubble wrap or polystyrene.
- Place the wrapped egg in this nest of stuffing.
- Zip up the bag.
- Drop the bag, egg at the top, from a height of approximately 1.5 metres.

Unwrap the egg. Is it broken? Cracked? Discuss this demonstration as a model.

- In what ways does it represent someone wearing a helmet hitting the ground?
- In what ways is this representation not quite right or useful?

Phase 2 – no helmet

Pop the egg, without any packing, inside a zip lock bag (to contain the mess).

It is likely the class will all predict that the egg will break without the bubble wrap packing.

Instead of dropping it from the same height, ask students to guess what from what height the egg could drop without breaking.

Take suggestions and choose the lowest.

If it survives that height, move it up and try the next height.

It is unlikely to survive more than a 15cm drop.

This is an opportunity for an interesting conversation about just how fragile eggs and heads are and just how effective bubble wrap and helmets are.

Teacher support material

For further activities and curriculum support:

Science in motion (Waka Kotahi Education Portal)

STUDENT ACTIVITY

Exploration

Look at your cycle helmet. How many parts can you see?

Draw what you see.

What do you think is the job or function of each part? Label each part and annotate with its function.

Investigation

Look at your piece of wood and note how smooth its surface is, on both sides.

- Place the piece of wood flat on the ground.
- Put on your safety glasses.
- Hit the piece of wood hard in the middle with the hammer, once. Only once!

Now look carefully at the piece of wood. Does it have a mark? An indentation?

This activity is a model of falling and hitting your head. What does each component represent?

Was there a helmet involved?

Now turn over your piece of wood so that you have a smooth surface.

- Put the piece of polystyrene on top of the wood.
- Put on your eye protection.
- Hit the piece of polystyrene hard in the middle with the hammer, once. Only once!

The hit represents someone who is wearing a helmet, falling from their bike and hitting the ground with their head.

Now carefully look at this side of the wood. Does it have a mark? An indentation?

What does the polystyrene represent in this model?

Things you'll need
Cycle helmet
Piece of wood (at least 10 x 5 x 2 cm)
Piece of 3-5cm deep polystyrene that fits on top the wood
Hammer
Safety glasses
Models in science sheet

Think and discuss

What was the effect of the polystyrene?

How effective was having the polystyrene between the wood and the hammer?

In this model of a head and a fall, what are the similarities to real life?

What are the differences?

Thinking about models in science

Recap your *Exploration* exercise by labelling and annotating the picture of the cycle helmet on your *Models in science* sheet.

Now think about the two models you've seen and used in this session.

What does each thing represent? Label it on the diagram. One has been done for you.

Write a sentence or two about how accurate a representation each model is – its strengths and weaknesses.