teachers guide

# Forces 4: Forces in the human body

## Components

| | NAME | DESCRIPTION | AUDIENCE |
|---|---|---|---|
| | *Forces in the human body* teachers guide | This guide contains strategies that provide opportunities for students to apply their understandings of unbalanced forces to situations that affect the human body. | teachers |
| | *Forces in the human body* video | A video shows how an understanding of forces can be used to diagnose and provide solutions to medical issues. | students |

## Purpose

This resource provides students with opportunities to **Elaborate** on their understandings of balanced and unbalanced forces, by applying their knowledge to new contexts.

## Outcomes

Students:

- understand that multiple forces on an object can be combined into a single force that has the same effect;
- develop an understanding that forces can be used to protect us from damaging effects of large unbalanced forces; and
- appreciate regulations about wearing seatbelts or safety helmets are based on scientific understandings of forces and motion.

## Activity summary

| ACTIVITY | POSSIBLE STRATEGY |
|---|---|
| Review students' knowledge of forces and motion, including:<br>• balanced and unbalanced forces, and<br>• effects of forces on motion. | whole class discussion |
| Students watch the video, *Forces in the human body*, and answer questions, in the 'Information for teachers' section below. This may take the form of a research project or a class/group discussion. | working individually, small groups or whole class |
| Teacher allocates a follow-up task to each group:<br>• design and construct a capsule to protect an egg in a 2 m fall; or<br>• plan and conduct your own investigation into how bicycle helmets, car seat belts, air bags or baby capsules protect occupants in the event of a collision. | small groups |
| Students present to the class features of their egg capsule and why it was successful/unsuccessful.<br>Or, students explain to class how bicycle helmets, car seat belts, air bags or baby capsules protect occupants from effects of large forces in a collision. | whole class |

In small groups, students undertake either a design exercise or an investigation.

**Design exercise**

Students design a capsule to protect an egg in a 2 metre fall. To complete the task, students:

- design and construct a capsule from commonly available materials, such as: paper, cardboard, bubble wrap, drinking straws, adhesive tape …;
- test and modify their capsule design, as required, to ensure it meets its purpose;
- demonstrate to the class the success (or otherwise) of their design;
- describe (verbally, orally or visually) design features of their capsule; and
- apply their knowledge of forces to evaluate and explain the effectiveness of their design.

**Investigation**

Students plan and conduct an investigation into how bicycle helmets, car seat belts, air bags or baby capsules protect people from effects of large forces in a collision. To complete the task, students:

- select one of the above safety devices and research how it protects users from effects of large forces;
- explain (verbally, orally or visually) how the device minimises force on users;
- design and construct a model of the safety device, from commonly available materials, such as: paper, cardboard, bubble wrap, drinking straws, adhesive tape …;
- plan and conduct an investigation of their design; and
- evaluate the effectiveness of their design.

## Technical requirements

The teachers guide requires Adobe Reader (version 5 or later), which is a free download from www.adobe.com.

QuickTime version 7 or later is required to view the video. This is a free download from www.apple.com/quicktime. A high quality MP4 version with subtitles is available on CD-ROM or download from the SPICE website.

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## SPICE resources and copyright

All SPICE resources are available from the Centre for Learning Technology at The University of Western Australia ("UWA"). Selected SPICE resources are available through the websites of Australian State and Territory Education Authorities.



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## Associated SPICE resources

*Forces 4: Forces in the human body* may be used in conjunction with related SPICE resources to address the broader topic of forces and motion.

| DESCRIPTION | LEARNING PURPOSE |
|---|---|
| *Forces (overview)*<br>This learning pathway shows how a number of SPICE resources can be used to teach concepts of balanced forces, unbalanced forces and motion. | |
| *Forces 1: Introduction to force*<br>A video stimulates students' interest in learning about forces and motion, and elicits prior knowledge and misconceptions. | **Engage** |
| *Forces 2: Investigating forces*<br>Practical activities provide opportunities for students to explore effects of forces on the motion of objects, including those falling in Earth's gravity. | **Explore** |
| *Forces 3: Balanced and unbalanced forces*<br>An interactive learning object enables students to explain and predict effects of balanced and unbalanced forces on objects. | **Explain** |
| *Forces 4: Forces in the human body*<br>Students apply their understanding of forces and motion to new contexts, such as: forces in the human body or designing and testing the effectiveness of a safety capsule to protect passengers in motor vehicle collisions. | **Elaborate** |